

JANUARY 15, 1948

Engineering Library

An illustration featuring a factory with three tall smokestacks on the left. A white ramp extends from the factory towards the right. Along the ramp, several vehicles are shown in silhouette, including a car, a truck, and a bus. The title "AUTOMOTIVE INDUSTRIES" is printed in large, bold, stylized letters across the middle of the ramp.

# AUTOMOTIVE INDUSTRIES

## IN THIS ISSUE

**Super Octane Motor Gasolines—When Do We Get Them?**

**Buick's New Dynaflow Transmission**

**Knock-Free Low Octane Operation**

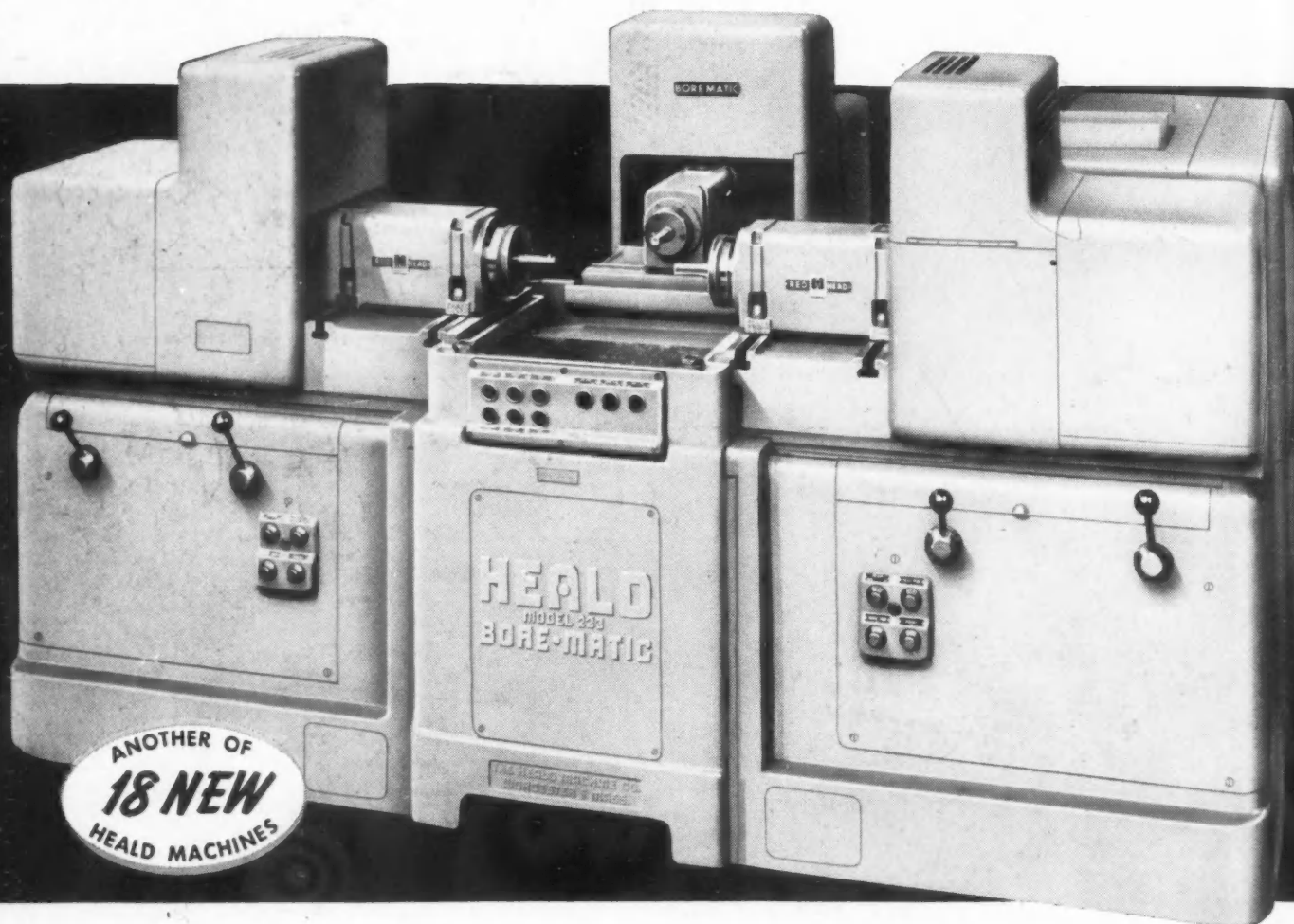
**Ford's New 145 Hp Truck Engine**

**Blowing Bubbles for Helicopters**

**Latest Methods for Cleaning Aluminum**

*Complete Table of Contents, Page 3*

# Completely New HEALD Multi-Way BORE-MATICS



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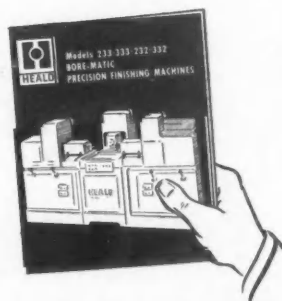
having workholding fixtures readily adaptable to large cumbersome parts or awkwardly shaped work. Into them has been incorporated a vast fund of Heald engineering research and experience, including such outstanding Heald features as:

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# AUTOMOTIVE INDUSTRIES

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January 15, 1948

Vol. 98, No. 2

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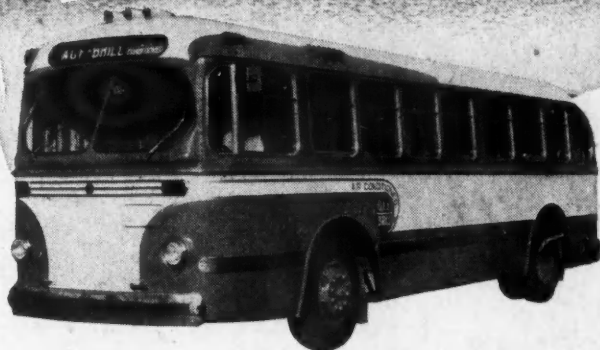
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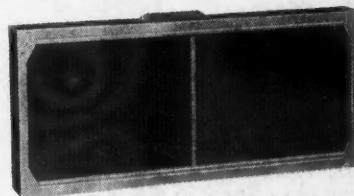
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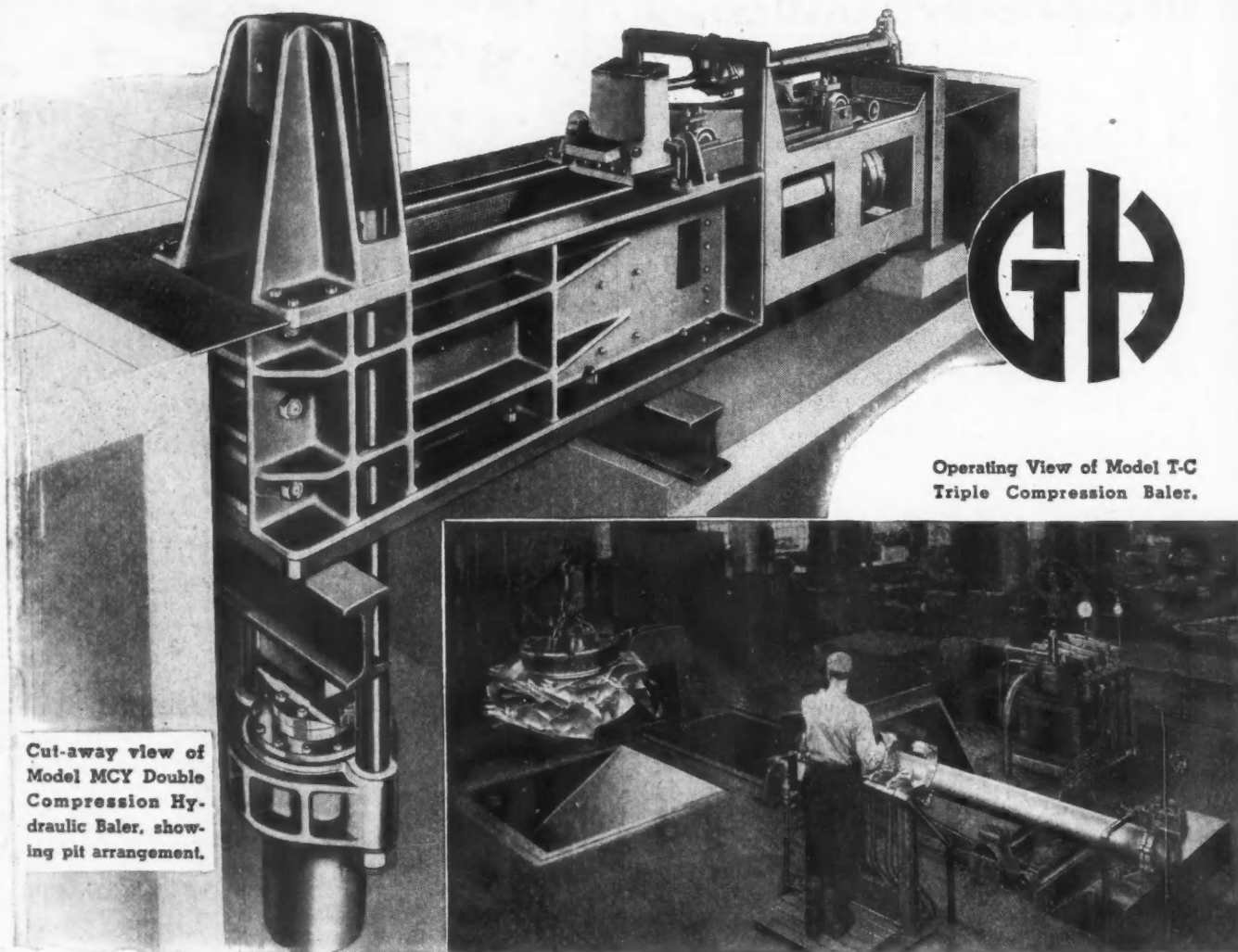


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**AUTOMOTIVE  
INDUSTRIES**

Reg. U. S. Pat. Off.

January 15, 1948

## High Spots of This Issue

### Buick's New Dynaflo Transmission

A complete description of Buick's new hydraulic torque-converter transmission, offered as optional equipment on the '48 Roadmasters, is given in Detroit Editor Joseph Geschelin's article on the 1948 Buick line, beginning on page 28.

### Thompson Vita-Meter Eliminates Knock

Knock-free engine operation on low-octane gasolines has been achieved by use of the Thompson Vita-Meter, a device for injecting anti-detonant fluid into the engine manifold. P. M. Heldt describes this new development on pages 32 and 33.

### Ford Introduces 145-Hp V-8 Truck Engine

A brand-new 145-hp V-8 engine, featuring zero-lash hydraulic valve lifters, highlights the 1948 Ford truck line. Two new extra-heavy-duty models of GVW up to 21,500 lb have been introduced, and the 95-hp six and 100-hp V-8 engines have been redesigned. For complete details, see pages 34-37.

### Preselective Overdrive Control

A preselective finger-lift type of overdrive control for passenger cars, incorporated with the steering column gear-shift lever, gives transmission operating characteristics to the overdrive. Robert C. Mack, Engineering Editor, describes the device on pages 38 and 39.

### Cleaning Aluminum for Painting

A comprehensive article on latest methods of cleaning aluminum for painting, together with a description of the conveyor method used at Douglas Aircraft Company's El Segundo, Calif., plant, is presented on pages 42 and 43. The author, S. H. Phillips, is Process Engineer at Douglas.

### 23 New Product Items

#### And Other High Spots Such As:

The outlook for super octane motor gasolines; a 500-ton Verson press for high-volume production of AC spark plugs; and Bell Aircraft Corp.'s method of producing plastic cabin enclosures for helicopters.

### Starting in the Next Issue—

Revealing story of USSR motor vehicle industry.

*News of the Automotive Industries, Page 17*  
*For Complete Table of Contents, See Page 3*





## Here's Coast-to-Coast Service on Alloys

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# RYERSON STEEL

# NEWS *of the*

## AUTOMOTIVE INDUSTRIES

Vol. 98, No. 2

January 15, 1948

### **Automotive Firms Optimistic About 1948 Output**

Judging from year-end statements by automotive executives, 1948 is going to be a prosperous and successful year. Without exception, optimism is the keynote, although it is tempered by many ifs and buts, dealing principally with shortage of steel and possible interruptions from strikes. Little hope is held for much more steel in the first six months, but generally, it is believed that the industry will get 10 to 15 per cent more steel this year than in 1947,

flecting our internal economy, but also by the broader gauge conditions that our new role in international affairs dictates. If we were to strike a balance on our ledger sheets, however, I think our final net would be one of optimism . . ."

### **Delay Oldsmobile V-8 Engine Until Late 1948**

It is now definitely established that Oldsmobile will continue with a straight eight in its 98 line, at least most of this year. The division definitely has a V-8 under develop-

is already being used by Nash, and Hudson incorporated the unit frame in its new model. Engineers generally believe that it will be only a matter of time before all companies will adopt it. A principal factor influencing the speed with which it is adopted is the cost of obsoleting present tooling and of installing new jigs, fixtures and equipment required to build the new type body. Monocoque construction would tend to change assembly line techniques, and it is reported that considerable savings can be made with it.

### **1947 Output in U. S. & Canada Tops 5 Million**

With final estimates of 1947 automobile and truck production in, it now appears that the extra burst of speed put on at year end brought the total to about 5,050,000 units. That figure represents production in the U. S. and Canada and is the third highest on record, being exceeded only in 1929, when 5,621,045 were built, and 1941, when the total was 5,110,693 units. The 1947 figures show the big three in the same respective positions they held before the war. General Motors was first with a total of 1,840,498 vehicles in the U. S., and 85,360 in Canada for a total of 1,925,858 in both countries. U. S. production was accounted for as follows: Chevrolet, 695,993 cars and 335,346 trucks; Pontiac, 223,015; Oldsmobile, 191,454; Buick, 267,830; Cadillac, 59,436; GMC Truck & Coach, 61,918 trucks and 5,506 coaches. GM of Canada turned out 60,542 cars and 24,818 trucks. GM production in 1946 was 1,186,057; in 1941 it was 2,360,659, and in 1940, 2,093,936.

Ford was in second place with a grand total of 1,192,403 vehicles. In passenger cars, the totals were: Ford, 601,655; Mercury, 124,612; and Lincoln, 29,275. Trucks totaled 247,832 last year, compared with 198,767 the year before. The company also built 85,589 tractors and 2256 coaches in 1947. Ford of Canada built 101,184 cars and trucks last year.

Chrysler Corp. was in third place with a total output of 1,006,000 units in 1947 in the U. S. and Canada.



### **NEW 1948 CHEVROLET**

*Displaying design changes effected in a minimum changeover period, the new 1948 Chevrolet features a redesigned radiator grille, and engine changes which provide a more rigid crankshaft and new precision, interchangeable, main bearings.*

and that production could rise accordingly. Nicholas Dreystadt, general manager of Chevrolet, possibly summed up the situation better than anyone else when he said: "At no previous time in the history of my association with the automobile industry has it been more difficult to forecast the prospects for a new year. Uncertain and unsafe at best, predicting the immediate future is today a more hazardous undertaking than ever before. The automobile industry has operated ever since the end of the war on a basis of more variables than I care to account for . . . Today, our picture is overshadowed not only by conditions re-

ment, and for a while it was thought that it would be ready for introduction in the 1948 model. However, indications now are that it will go into production late this year. Some of the equipment required for making the new engine has been ordered, and is scheduled for delivery this fall.

### **Engineers See Growing Trend To Unit-Frame Car**

Monocoque or unit-frame construction for automobiles appears to be a development that will come into general use in automotive construction during the next few years. It

# NEWS *of the* AUTOMOTIVE INDUSTRIES

During the prewar period, Chrysler passed the one million mark four times. In fourth place on passenger car production was the youngest company in the industry, Kaiser-Frazer Corp. It is significant to note the gap between the big three and their nearest competitor among the independents. While the large companies ran up totals of more than a million units each, K-F in fourth place turned out 144,490. Unofficially, other companies in order of placing were Studebaker with 123,506 cars and 86,129 trucks (for a total of 209,635 units which would make it fourth in total number of vehicles); Nash, 113,502; Hudson, 100,900 cars and 2000 trucks; Packard, 52,300; Willys, 33,300 station wagons and 67,800 trucks and jeeps; and Crosley, 19,600 cars and 3000 trucks.

## **Towne Shopper, Small Light Car, to be Made in San Diego**

To be built at the rate of 50 a day early this year by the International Motor Car Co. of San Diego, Calif., the Towne Shopper features an aluminum body and a rear-mounted engine. The front section is used as a luggage compartment. The car has a maximum speed of 45 mph, and will obtain between 35 to 40 mpg under ordinary driving conditions, it is reported.

With a 63 in. wheelbase, the Towne Shopper measures 116 in. in overall length, 50 in. in height to the top of the windshield and uses 4.00x8 tires. It weighs about 600 lb. The factory in San Diego is being equipped with almost \$500,000 worth of machinery and tools, the company announced.

## **Willys Makes 119,733 Units in 1947**

Producing a total of 119,733 cars and trucks during the calendar year 1947, Willys-Overland Motors, Inc. reached its highest peacetime production total since 1929. Output of 12,242 vehicles in December marked a monthly high for the same period, according to James D. Mooney, president and board chairman. Production has already started on the new Jeep Station Sedan, and the Jeepster is scheduled for May production. During 1947, the company produced 77,400 Universal Jeeps; 33,285 station wagons; 4114 four-wheel-drive trucks; 3734 two-wheel-drive trucks; 899 sedan delivery

trucks; and 51 new station sedans. The company has set 238,000 vehicles as its production goal in 1948.

## **Production Increase Doubtful in 1st Qtr. of '48**

Although the automobile industry hung up a new postwar production record in December, with a total of more than 483,000 in the U. S. and Canada, it was only at the expense of January and probably February, it is reported. Many companies in

## **GM To Build New Plant in Belgium**

Replacing a plant which was built in 1925, and which built 230,000 passenger cars, trucks and buses before it was destroyed during the war, a new assembly plant will be built by GM in Antwerp, Belgium. In making this announcement, Warren T. Lutz, GM continental manager, further disclosed that the new plant would represent the last word in construction, based on his observations of new GM buildings in Flint, Mich.



## **BARGAIN SHOPPER**

*The Towne Shopper, produced by the International Motor Car Co., San Diego, Calif., is the newest addition to the small car fraternity. Priced at \$595 fob San Diego, the Towne Shopper is powered by a 10-hp., two cyl., opposed horizontal, air-cooled Onan engine which is mounted in the rear.*

order to make as good a showing as possible for the year, dug deeply into stockpiles, with the result that they now are scraping bottom. According to trade sources, the production outlook for January and February is not quite as high as that reached in December. Some even predict that there will be little or no increase until after the first half of the year. Steel supplies are still very tight, and scant relief is expected before summer. Also, some companies will be down for model changeover during the first half, notably Ford, which will leave a larger gap for other companies to fill if monthly production is to hold up.

## **Use New Synthetic Yarn Fabric in Some '48 Chryslers**

A new upholstery material composed of synthetic yarns is being used by Chrysler in some of its 1948 station wagons and convertible models. The seat material is washable, spot proof, stain proof, acid proof, and is said to give double the service of wool or cotton. The material has a characteristic which enables it to "breathe."

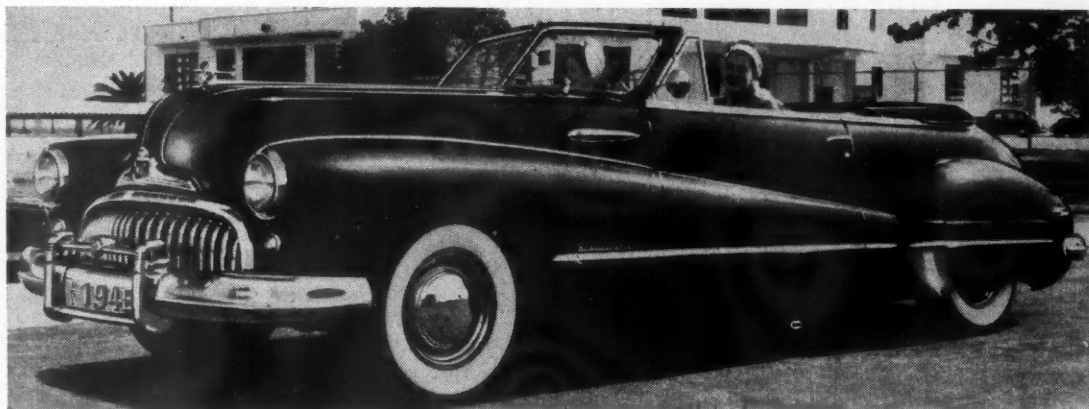
No immediate style changes are planned for current Chrysler Corp. models, according to K. T. Keller, president. Changed already by the adaptation of wider, low pressure tires to Chrysler, Dodge, De Soto



# NEWS of the AUTOMOTIVE INDUSTRIES

## '48 BUICK

The 1948 Buick Roadmaster Convertible is equipped with hydraulically-operated top, door windows and front seat adjustment. The new Dynaflo drive is featured as optional equipment on the 1948 Roadmaster model. For complete details see page 28.



and Plymouth models, current model styles will continue through most, if not all, of 1948.

The corporation started titling its cars as 1948 models on Jan. 1, 1948. Chrysler's big model change probably will come late this year. Die shops in Detroit are heavily engaged in Chrysler die work, and it is estimated that the first completely new postwar styling changes will be made by the end of 1948.

## Ford Starts Production at Two New Plants

In praising the teamwork of Ford employees which resulted in the output of over a million vehicles, Ernest R. Breech, executive vice-president of the Ford Motor Co., disclosed that limited production was underway before the year's end in two plants acquired during the year. One was at a forging unit at Canton, Ohio, and the other at a machining operation located at Nine Mile and Mound Roads in the Detroit area. As part of the \$500 million postwar expansion program, factory floor space of

the Ypsilanti, Mich., plant, which makes electrical equipment for cars, is being doubled. It is expected that three new Lincoln-Mercury assembly units will begin operations early in 1948. Late in 1947 construction was started on one wing of the dynamometer building, the initial step in the projected research center program at Dearborn.

The company has moved more than \$2 million worth of government-owned equipment and materials out of the Mound Road plant since it took over the 19 building Naval Ordnance unit in September. Manufacturing operations started five weeks ahead of schedule. Items scheduled for production there include drive shafts, rear axle and transmission parts, various heavy stampings, and front suspension components. The company used many assembly line techniques to remove materials from the buildings, and production line methods for making boxes, skids and pallets for efficient handling. An average of 50 freight car loads of materials and equipment was removed each working day.

## K-F Repays Loan 60 Days Before Date Due

Kaiser-Frazer Corp. has repaid in full a \$12 million loan obtained from the Bank of America last February. Payments totaling \$1,080,000 were made as they fell due and the balance of \$10,920,000 was paid off in late December. K-F closed the year with a cash balance of approximately \$18 million, and with all trade accounts on a current basis, according to a company announcement. Production has passed the 1000 a day mark, and the next objective is 1500 a day by next summer, with a total output this year of more than 300,000 cars.

## Crosley Plans 1948 Output of 3000 a Month

Crosley Motors, Inc., is planning a production rate which will rise to 3000 units a month during 1948, according to Powell Crosley, Jr., president. He said that in line with his company's policy of providing low cost transportation, it is determined

## 9-CROSLEY HAULAWAY

A new nine-car haul-away truck, delivering nine new Crosley station wagons, recently traveled from Marion, Ind., to New York City. Designed by the Kenosha Auto Transit Corp., in conjunction with Crosley engineers, the trailer's steel framework holds three cars, while six can be shipped three in a row on top of the vehicle's upper deck.



# NEWS of the AUTOMOTIVE INDUSTRIES

## HUDSONS MULTIPLY

Averaging about 2000 cars a week, production of the 1948 Hudson is steadily increasing in volume. With two-line production now under way, employment has increased and over 15,000 people are now on the payroll.



to keep prices at levels which the great number of people can afford. He added that although he has no idea of trying to compete in volume with manufacturers of larger cars, the Crosley's place in the market will continue to expand.

## 38th National Motor Boat Show Opened on Jan. 9

The 38th National Motor Boat Show opened in New York City on Jan. 9 with a total of 231 exhibits. Nearly 200 inboard and outboard runabouts and utilities of various sizes, 34 cruisers from 22 to 42 ft in length, and 28 sailboats were displayed. Gasoline and Diesel marine engines were shown by 30 manufacturers, and there were over 140 exhibitors of marine hardware, accessories and service. Exhibits will be reviewed in a later issue of AUTOMOTIVE INDUSTRIES.

## Boost Ford Tractor Price to \$1190

Dearborn Motors Corp. has announced a price increase on the Ford tractor because of increased costs. The new price, which was effective Jan. 2, is \$1190 fob Detroit, an increase of \$95.

## Canada to Admit Machinery to Make Car Parts

It is reported from Canada that new machinery and equipment required to make automobile parts in Canada, previously made in the U. S., will be admitted in practically any quantities required. Under a recent government order, importations of new automobiles was prohibited with a view toward conserving the Canadian dollar balance. As a result, it is expected that plant capacity there will be expanded and more component parts will be built in that country. Building materials needed for plant additions will also be admitted to the country under the agreement.

## Federal Excise Tax on Tires Nearly 4 Times 1940

The Rubber Manufacturers Association has estimated that Federal excise taxes on tires and tubes last year amounted to nearly \$170 million, compared with a total of about \$45 million in 1940 before excise taxes were increased. An appeal is currently before Congress to reduce the tax on casings, which ranges from seven to 14 per cent of the sales price. It is contended that the high level of tire taxes in the higher

bracket approaches that of taxes on luxury items.

## New 6-Cyl Continental Engine Develops 145-hp

A new 145-hp, horizontally-opposed, six-cyl airplane engine has been announced by Continental Motors. Designated as the C-145, the new engine will be used in four-place models to be announced by two airplane manufacturers, according to Continental.

## Du Pont Now Marketing Tetraethyl Lead

With the new year, Du Pont began marketing tetraethyl lead anti-knock compounds direct to refiners. At the same time, district sales offices and laboratories were opened throughout the country, along with two new general laboratories, a Road-Test Laboratory at El Monte, Calif., and an Engineering Laboratory at Deepwater Point, N. J. The company has been making tetraethyl lead for 24 years and has been responsible for much of the development of equipment and manufacturing processes.

## Salisbury Designs Atomicar, New Amphibian Car

A two-wheeled amphibious midget car, that looks like a wingless airplane, has been designed in Buffalo by Frank M. Salisbury, former assistant chief engineer for Bell Aircraft Corp. He calls his latest creation the Atomicar. It is powered by an air-cooled engine in the rear, and is hydraulically-driven, i.e., no conventional clutch, differential, or transmission. The Atomicar, with a clear plastic canopy, has no pedals or steering wheel. It is operated by a stick, comparable to that in an airplane, which controls its forward and reverse movements, its steering, braking and acceleration.

"It is really a fully-enclosed motorcycle," said Mr. Salisbury. "It has two retractable wheels which drop automatically when the speed is reduced to five mph and which retract again between five and eight mph. Its biggest feature is automatic stabilization to prevent tipping at low speeds." Mr. Salisbury said that the car will be built for speeds not to exceed 45 mph; will run about 45 mpg, and will sell for under \$500. Quantity production will not be attempted before 1949.

# NEWS *of the* AUTOMOTIVE INDUSTRIES

## Merge Boeing Aircraft Co. With Boeing Airplane

In order to simplify the corporate structure, the Boeing Aircraft Co., a wholly-owned subsidiary, was recently merged with the Boeing Airplane Co., the parent organization.

## Forest H. Akers Retires from Dodge

F. H. Akers, vice president, director, and general sales manager of Chrysler's Dodge Div. retired at the end of last year. He had completed 25 years of service with Dodge last October. Before joining Dodge he was associated with Reo Motors, Inc. E. C. Quinn, sales manager since 1945, has been appointed general sales manager to succeed Mr. Akers. He has been associated with Chrysler since 1934 and with Dodge since 1935.



## NEW SHELL LABORATORY

Recently completed by the Austin Co. for Shell Oil at Houston, Texas, this new \$1.3 million, two-story Exploration and Production Research Laboratory has over 100 separate working areas in a 44,000 sq ft air-conditioned layout arranged in the form of an H.

## Appoint Lewellen to Post on Highway Safety Group

That highway safety is of supreme interest to automobile and other executives concerned with the industry is indicated by the high ranking officials who serve on the National Industry Inter-Highway Safety Committee. At a recent meeting, J. J. Newman, vice president, B. F. Goodrich Co., was elected chairman and W. G. Lewellen, GM vice president, was named vice chairman. K. B. Elliott, vice president in charge of sales for Studebaker Corp., was appointed to the committee by AMA to replace L. W. Slack who recently resigned as vice president and gen-

eral sales manager of Packard. The committee will meet this month to formulate plans for highway safety activities.

## Industrial Furnace Group Names Contest Judges

The Industrial Furnace Manufacturers Association, Inc., has announced the names of the five judges who will select the prize winning articles in its current \$1500 Prize Contest which closes Oct. 1, 1948. The five judges are Alexander H. d'Arcampal, vice-president and consulting metallurgist, Pratt & Whit-

ney Div., Niles-Bement-Pond Co., West Hartford, Conn.; Dr. E. S. Davenport, assistant to vice-president, United States Steel Corp., Pittsburgh, Pa.; George W. Mason, president, Nash-Kelvinator Corp., Detroit, Mich.; R. H. McCarroll, Director of Chemical Engineering and Chemical and Metallurgical Research and Chairman of the Industrial Engineering Committee, Ford Motor Company, Dearborn, Mich.; Dr. S. R. Scholes, Dean, New York State School of Ceramics, Alfred University, Alfred, N. Y.

## Traffic Experts See Threat in Car Use Congestion

Leaders of the passenger car industry are keenly aware of the importance of traffic congestion, but they got little encouragement from a traffic experts meeting in Chicago recently. They said that traffic congestion will continue to increase, and will be a threat to the full utility of the automobile. One economist at the meeting predicted that there will be 810 passenger cars for every 1000 families in this country by 1950, compared with the present ratio of 736 cars for every 1000 U. S. families. He said that not only will the ratio of cars to families increase, but that the number of families is increasing yearly and, in addition, the average motorist has increased his driving by 100 miles a year since 1936 so that average mileage now is 9285 a year.

## MOTOR VEHICLE FACTORY SALES FROM U. S. PLANTS\*

	Total Motor Vehicles			1947	1946	1941
	Passenger Cars	Trucks	Buses			
Total—Six Months.....	1,721,391	618,128	9,128	2,348,647	978,268	2,998,400
August.....	261,158	83,486	1,765	349,409	346,209	144,726
September.....	307,942	110,720	1,608	420,270	328,795	234,857
October.....	315,969	118,365	1,667	436,001	391,727	378,032
November.....	305,148	87,611	1,417	394,176	376,156	352,759
Total—11 Months.....	3,191,239	1,119,065	17,391	4,327,695	2,713,815	4,554,558

## FACTORY SALES TO DOMESTIC AND FOREIGN MARKETS\*

	Passenger Cars		Trucks		Buses	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
Total—Six Months.....	1,589,563	131,828	485,616	132,512	7,950	1,178
August.....	240,358	20,800	66,382	20,104	1,570	195
September.....	285,590	22,352	89,724	20,996	1,413	195
October.....	295,099	20,870	94,307	24,058	1,527	140
November.....	284,730	20,418	71,161	16,450	1,142	275
Total—11 Months.....	2,953,221	238,018	885,634	233,431	15,296	2,095

\* Automobile Manufacturers Association.



# NEWS of the AUTOMOTIVE INDUSTRIES

## Ward LaFrance Truck Corp. Buys Truck Div.

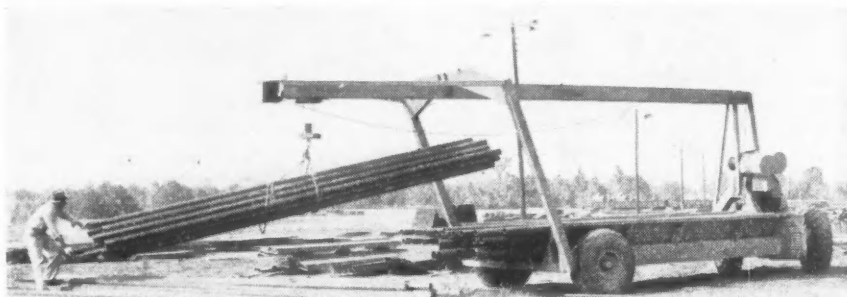
Great American Industries Inc. has announced the sale of its Ward LaFrance Truck Div. to its former owners, A. Ward LaFrance and Joseph G. Grossman who will operate the business under the name of Ward LaFrance Truck Corp.

## Living Costs Affected Little By Lower Car Prices

Frank Rising, general manager, Automotive and Aviation Parts Manufacturers, Inc., makes some interesting comments about current propaganda which holds that lowering of prices by manufacturers would result in a significant lowering of the cost of living. He points out that expenditures for food account for 31 per cent of the average budget, clothing for 12 per cent, and rent for eight per cent, and that reducing prices of automobiles, refrigerators and similar hard goods would not significantly help the average family budget. He quotes the Harriman report in stating that food price increases account for 61 per cent of the rise in combined consumer prices from 1939 to now. He says that manufacturers as such could go without profits entirely or even sell their products at a loss, and the big item in the cost of living would still be food.

## President's Medal for Merit Awarded to Mason Britton

The highest civilian award that the President of the United States can bestow, the Medal for Merit, was recently awarded to Mason Britton, president, Metal Cutting Tool Insti-



## ROUGH ROAD HAULER

Demonstrating rapid self-loading of heavy pipe, this new heavy-duty Tournahauler, built by R. G. LeTourneau, Inc., is reported to have enough power and traction to travel on-road or off-road with loaded capacities ranging from 20 to 100 tons. Equipped with a new type Tournamatic differential, the Tournahauler's prime movers are available in models powered by either Diesel engines or butane-burning engines.

tute. Mr. Britton performed outstanding service to the U. S. during the war while on the National Defense Advisory Commission, and in the Office of Production Management, later the War Production Board, where he was in charge of the production and distribution of tools.

## New 1948 Hillman Minx Has Synchromatic Transmission

Following the example of the Humber Hawk, a synchromatic transmission has been applied to the modified 1948 Hillman Minx. Both cars are produced by the Rootes Group. Mechanical changes are of a minor nature. The compression ratio of the four cyl, L-head, 71 cu in. engine has been dropped from 6.5 to one to 6.3 to one, in order to meet present low octane fuel requirements. Maximum output is 35 hp at 4100 rpm. Lockheed hydraulic brakes with two leading shoes have

been adopted for the front wheels. The parking brake is mechanically applied by a lever between the front seats. The main oil passage in the base chamber has been provided with detachable end plugs to facilitate cleaning. Piston rings are deeper and narrower.

The four-door sedan has centrally hinged doors, a sliding roof, a fixed windshield, and an alligator hood locked from the inside of the car. Combined head and parking lights are set in the front fenders. The radiator grille has horizontal bars, with a valence filling in the space between the bumper and the car. There is a square socket on each end of the bumpers to receive the four-cornered Stevenson-Smith screw-operated jack. Upholstery is pleated cloth with leather binding. Front seats are adjustable for tilt and leg length. The steering wheel has three spokes forming a T, leaving a clear view over the horizontal bar of the T to the speedometer immediately in

## SHIPMENTS OF COMPLETE AIRCRAFT AND AIRCRAFT ENGINES AND OTHER PRODUCTS OF THEIR PLANTS, 1947\*

AIRCRAFT			
	October	Ten Months	
Complete Aircraft.....	1,041	16,061	
For U. S. Military:			
Number of Planes.....	239	1,562	
Value of Planes and Parts.....	\$49,489,300	\$397,508,499	
For Other Than U. S. Military:			
Number of Planes.....	802	14,499	
Value of Planes.....	\$22,302,504	\$159,545,389	
Value of Parts.....	\$ 2,270,337	\$ 18,030,546	
Value of Complete Aircraft and Parts.....	\$74,062,141	\$575,084,434	
Value of All Other Products Incl. Conversions.....	\$ 3,221,349	\$ 41,088,484	
Total Value of All Products.....	\$77,283,490	\$616,172,918	

AIRCRAFT ENGINES			
	October	Ten Months	
For U. S. Military:			
Number of Engines.....	471	4,015	
Value of Engines.....	\$18,783,310	\$163,014,380	
Value of Parts.....	\$ 4,189,707	\$ 34,235,300	
For Other Than U. S. Military:			
Number of Engines.....	696	14,866	
Value of Engines.....	\$ 4,509,554	\$ 45,327,944	
Value of Parts.....	\$ 2,081,501	\$ 4,448,911	
Totals—Engines:			
Number.....	1,167	18,881	
Value.....	\$23,292,864	\$208,342,324	
Value of Parts.....	\$ 6,271,208	\$ 38,684,211	
All Other Products, Value.....	\$ 166,585	\$ 3,801,437	
Total Value, Engines and Parts.....	\$29,730,657	\$272,831,972	

\*—Bureau of the Census and Civil Aeronautics Administration.

# NEWS of the AUTOMOTIVE INDUSTRIES

front of the driver. A spare wheel is carried horizontally below the luggage compartment, the door of which is hinged at the top. Main dimensions of the car are wheelbase 92 in., front tread 47 $\frac{5}{8}$  in., rear tread 48 $\frac{1}{2}$  in., and overall length 156 in. Weight empty is 2086 lb. The Minx is listed at \$1540, plus purchase tax.

## Car Makers & Dealers Confer On Non-Competing Problems

Confusion surrounding a recent meeting between 10 representatives of the automobile manufacturers and five from NADA has been cleared up by an official statement. According to the statement, the most important points of agreement settled at the meeting were that manufacturers and dealers through their associations would cooperate unreservedly on all so-called "non-controversial" programs such as safety improvements, highways, and better parking facilities, and that factory dealer relationships of a contractual character are intrinsically competitive in nature and should so remain.

## Univ. of California Operating L.P. Supersonic Wind Tunnel

A low-pressure supersonic wind tunnel, reportedly the world's first, which duplicates pressure conditions up to an altitude of 250,000 ft, was recently placed into operation by the University of California at Berkeley, Calif. With a test section an inch square, this is a pilot model; however, a 10-in.-square operating tunnel is under construction and scheduled for completion this year.

## Labor

### GM and UAW-CIO Name New Umpire

General Motors and UAW-CIO announce the appointment of Saul Wallen of Boston as Impartial Umpire to arbitrate last step grievance disputes between the corporation and the UAW-CIO. Mr. Wallen is the fifth man to hold the office under the GM-UAW agreement which was established in 1940, and was the first in the automobile industry to use the umpire system. He has acted as arbitrator for many unions and during the war served in the regional office of NWLB at Boston. He is currently on the staff at Harvard University.

### UAW-CIO Locals Want Increase of 25¢ an Hour

Several locals of the UAW-CIO have jumped the gun on wage demands from automobile manufacturers. Five GM locals at Flint, Mich. and the Ford, Briggs and Plymouth units in Detroit have demanded an increase of 25 cents an hour. International union officials have indicated some embarrassment over the demands, but there is some opinion that the premature demands are not without official approval as part of the over-all strategy. Wage talks at General Motors can begin 60 days prior to the contract expiration date of April 28. A two-year contract is in effect at Chrysler, expiring in April, 1949, but can be opened once on the wage issue during that time

on 30 days notice. Ford also has a two-year contract, but wage talks cannot be opened until next July 15. Politics is also playing a part in the wage drive since annual elections in the locals will begin in February.

### Ford Lunch Period Dispute Near Settlement

Settlement of a dispute between the UAW-CIO and Ford Motor Co. over payment for a 20-min lunch period on other than 24 hr operations is near. The issue turned up at the last contract negotiations, and it was agreed at that time that it would be carried to the umpire for a decision. Hearings have been completed, and a decision is expected soon. Ford contends that the paid lunch period is costing more than \$8 million a year, and is placing the company at an unwarranted competitive disadvantage, especially since the Ford hourly rates are higher than those of competitors. Ford is the only automobile manufacturer currently paying for lunch periods. The practice was started during the war when it was expected that most operations would be on a three-shift basis.

## Metals

### Tin

The Reconstruction Finance Corp. has reached an agreement with Bolivian tin producers to purchase Bolivian tin ores and concentrates during 1948 and 1949. Varying directly with deviations in the value of Grade A tin in N. Y., the base price will be 90¢ a pound, fob, South American ports.

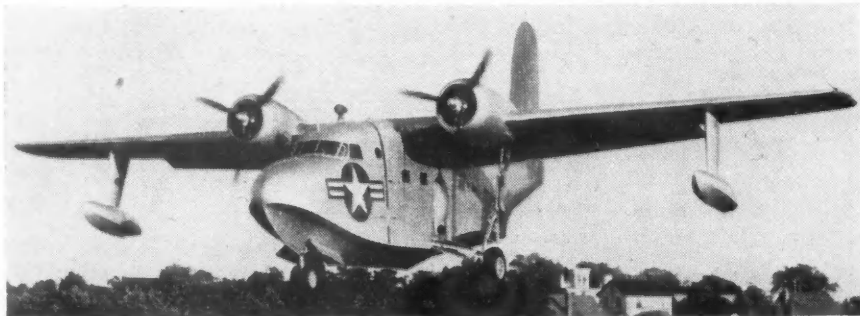
### Nickel

Based on an estimate of the freight rate increase, and on the 1.25¢ tariff reduction, the new spot price for electrolytic nickel, fob, New York, is set tentatively at 36.56¢ a pound.

### Lead

The U. S. Commercial Co. announced that 714 tons of Japanese lead scrap have been sold by the RFC to five U. S. bidders. The average price for the first eight lots was 15.50¢ a pound, and 17.031¢ the average price for lots 9 through 20.

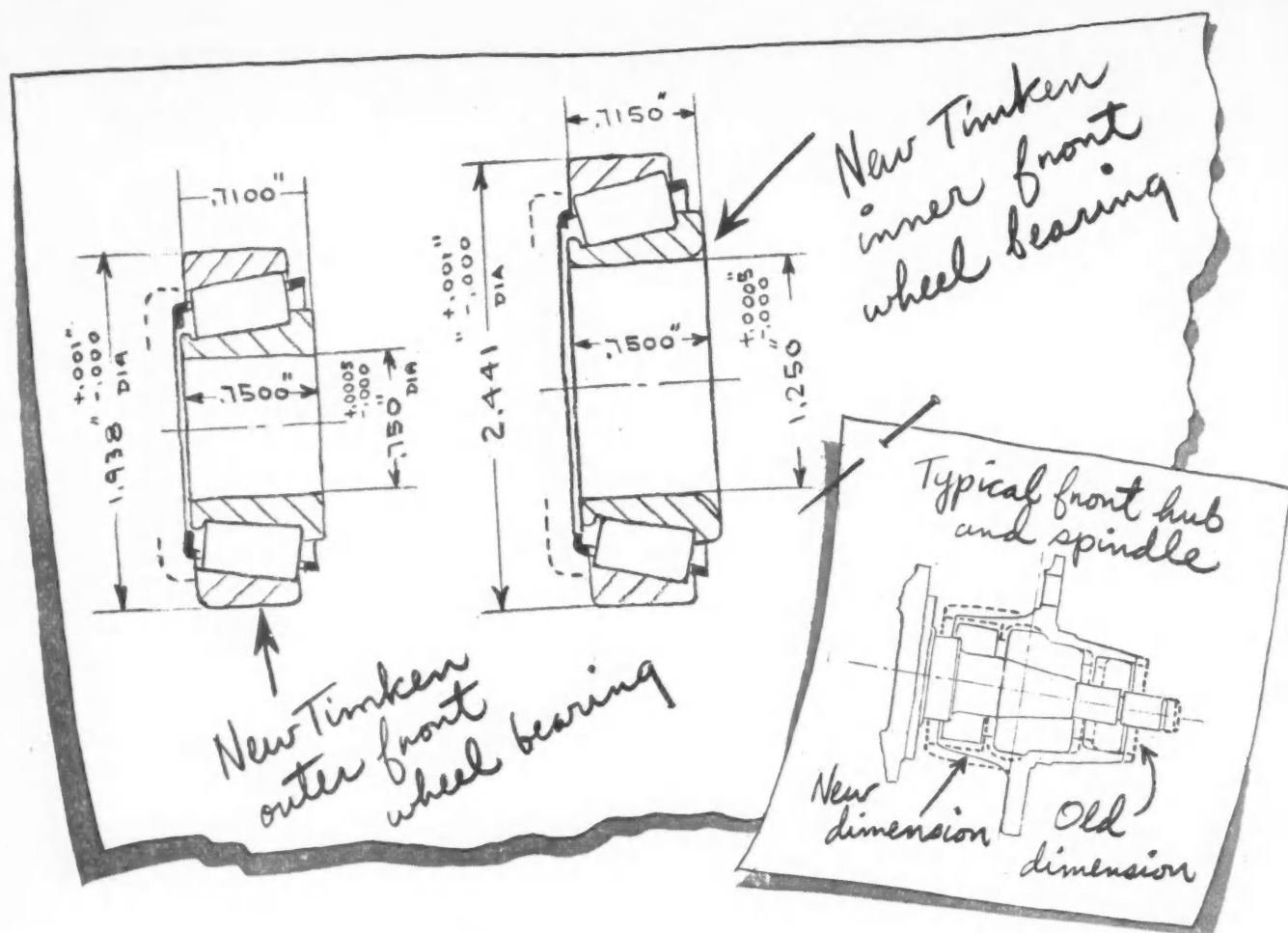
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### ROUGH WATER RESCUER

The Navy's newest amphibian utility plane, the XJR2F Albatross, built by Grumman Aircraft Engineering Corp., is designed for rough water operation in rescue work, and personnel or cargo transport. The plane was successfully test flown recently.

International News



## Two new front wheel bearing designs save 8 to 14 cents a car

TO meet the individual requirements of different auto manufacturers, Timken has long produced a wide variety of front wheel bearings.

If a way could be found to do the job with fewer bearing sizes manufacturing savings would be effected which could be passed along to the automotive industry. So a research project was launched.

The result is the two new Timken Company front wheel bearing designs shown above—one for inner application, the other for outer.

These two new bearings provide all the many advantages of Timken bearings for front wheels plus important new wheel and spindle design possibilities for lighter weight and greater compactness.

With automotive manufacturers standardizing on these two Timken

bearings, savings in bearing costs amount to from 8 to 14 cents a car! Standardization enables us to increase our volume of production and realize manufacturing savings which are passed on to our customers in the form of lower costs.

It's an example of the Timken engineering skill which is constantly at work to give the automotive industry increasingly better bearing performance at lowest possible cost—whether it be a long-

established application like front wheels—or a great new development like automatic transmissions.

If you'd like our help on your bearing problem, write The Timken Roller Bearing Company, Canton 6, Ohio. In Detroit, phone MADison 1380.

**NOTE TO P.A.'s.** Because every step of the manufacture of Timken bearings is controlled within our company... because our vast manufacturing facilities are widely dispersed... you will find the Timken Company a supply source of outstanding reliability.



NOT JUST A BALL  NOT JUST A ROLLER  THE TIMKEN TAPERED ROLLER  BEARING TAKES RADIAL  AND THRUST  LOADS OR ANY COMBINATION 



# How Far Away Are Super Octane Motor Gasolines?

By W. M. Holaday,

Director, Socony-Vacuum Laboratories

AS this issue of **AUTOMOTIVE INDUSTRIES** goes to press, the Society of Automotive Engineers is holding its 1948 annual meeting in Detroit, with hundreds of engineers and company executives in attendance from automobile, aircraft and suppliers plants throughout the country. Forty-eight papers are scheduled for the technical sessions. Particularly timely in light of the present gasoline supply situation is the paper by W. M. Holaday, director of Socony-Vacuum Oil Co. laboratories, in which he presented his views on the refinery production problems in connection with providing adequate supplies of motor gasoline for present-day engines and what the possibilities are of producing and distributing high octane gasoline for future high compression automobile engines of ratios up to 12 to 1. An extract of the paper begins on this page. Octane requirements of automobile engines differ at part throttle and full throttle, which offers a means of conserving petroleum since most of the time only low octane gasoline is needed. With that as a goal Socony-Vacuum engineers are developing a dual-fuel carburetor system. Another method in limited use is the Vita-Meter principle of injecting an anti-detonant at full or nearly full throttle, which is discussed in a special article on page 32. More data on these developments will appear in future issues of **AUTOMOTIVE INDUSTRIES**.

CRUDE runs to refining equipment during the summer of 1947 exceeded crude oil production by nearly 100,000 barrels per day and reached an all-time high of 5,300,000 bbl per day. To accomplish this, in excess of 95 per cent of the country's refining capacity was in operation. Such activity was entirely contrary to expectations since a slackening of production demand, rather than an increase, was anticipated as a result of storing the engines of war. With this high consumption of petroleum products, and the consequent lack in flexibility in refining operations, there has been little opportunity and even less economic inducement to direct fuel quality toward higher levels. This tight supply and demand situation probably will have to ease before the ever-present highly competitive spirit in the petroleum industry will be able to be effective in modifying refining equipment and operations to produce fuels of higher quality than have been produced heretofore. New refining equipment requirements to accomplish improved gasoline quality can be supplemented by the additional supplies of tetraethyl lead that have been promised.

The trend in consumption of petroleum products

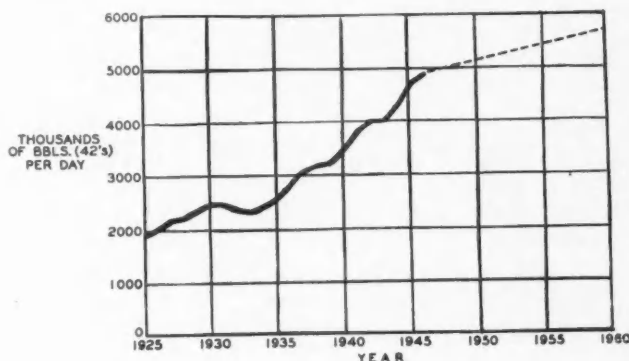


Fig. 1—Consumption of petroleum products in the United States.

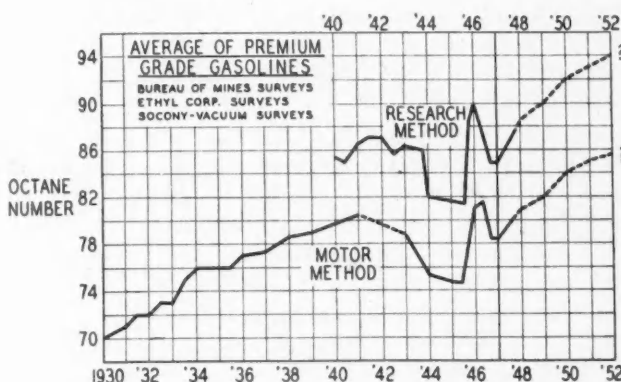


Fig. 2—Past and future trends in antiknock quality of regular grade gasoline.

from 1925 through 1947 is shown in Fig. 1. The disposition of the products making up this total consumption shows a pronounced change in demand from kerosene to gasoline during World War I, so that now gasoline accounts for 41 to 42 per cent of the total consumption, kerosene about six per cent and other fuel oils an additional 40 per cent. While total consumption of petroleum products is expected to increase markedly in the next decade, the distribution of products is not expected to change greatly.

Gasoline consumption for the average passenger car has increased from a level of 519 gal per car in 1930 to slightly more than 700 gal in 1946. The pre-war trend indicates the use of nearly 850 gal per car in the year 1950. Coupled with the increased number of cars on the road, this trend justifies the anticipated higher volume demands for motor gasolines. It is true that more efficient engines for passenger cars

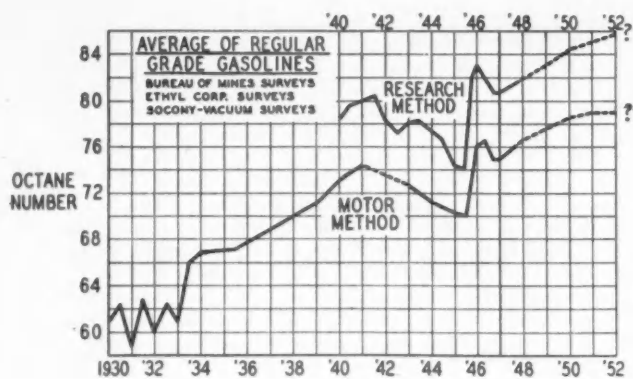


Fig. 3—Trends in antiknock quality of premium grade gasolines.

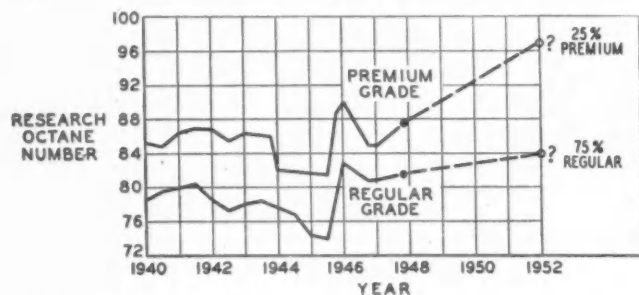


Fig. 4—Past and possible future trends in gasoline Research octane number.

have been promised by automobile manufacturers, but their influence on average consumption will probably not be felt for at least another five years.

During the war, catalytic cracking facilities were expanded ten-fold to support the aviation gasoline program with high quality base stocks and feed stocks for the production of aviation alkylate. Since the war, additional catalytic crackers have been installed with the result that gasoline stocks from this source now constitute in excess of 20 per cent of the total gasoline production. A substantial portion of these facilities were intended to replace obsolete thermal cracking units; however, high product demand and the need for refining facilities has, in general prohibited this move.

Figs. 2 and 3 indicate the effects of these changes in refining processes in raising the average antiknock quality of regular and premium grade gasolines. The trends since 1930 and possible future trends are indicated. The antiknock values given are for the month of January for the years indicated.

Since 1930, average regular grade gasolines have increased in motor octane number from 60 to slightly above 76, a level reached in the early months of 1946 and again being approached. Premium grade during the same period has increased from 70 to nearly 82 octane number. In both instances the decline in quality after March, 1946, was the direct result of a curtailment in the supplies of tetraethyl lead. With increasing supplies of this fluid becoming available, levels are again approaching the high 1946 level.

On the basis of past performance, trends have been extended to January, 1952. The estimate obtained in this fashion indicates regular grade gasolines of average Motor and Research ratings of 79 and 86; premium grade, 86 and 94. While an extension of

previous trends results in these values, future demands can alter the relative increase in antiknock quality of one grade of gasoline with regard to the other grade. To illustrate this possibility, Fig. 4 has been drawn illustrating the trend from 1940 to 1947 in Research octane number for regular and premium grade gasoline. The spread between these grades of gasoline has been about six octane numbers. If these trends are extended on the assumption that there will be a demand for premium gasoline of significantly higher antiknock quality, it may be possible to produce premium gasoline having a Research rating of 97 octane number. The regular grade gasoline would then have a Research rating of about 84 octane number, giving a spread in rating between the two grades of 13 octane numbers. In order to accomplish this very marked increase in premium gasoline antiknock quality, a reduction in volume of premium with a corresponding increase in volume of regular would be necessary. For the case illustrated, this would mean nationwide volume production of about 25 per cent premium and 75 per cent regular.

The potential flexibility of the refining industry in this regard can best be illustrated by analyzing the volume-octane number relationships of present day motor gasoline production. This analysis has been summarized in Fig. 5 which shows the relationship between the volume of premium and regular grade gasolines and the resultant antiknock quality for each grade. The analysis is based on current nation-wide motor gasoline production. Curves are given in this chart for TEL contents of one, two and three ml per gal. From these data it can be seen that the industry can make available—with an adequate supply of tetraethyl lead fluid—a limited volume of high-octane number motor fuel. Specifically, about 20 per cent of a premium gasoline having a Research octane number of 97 with two ml TEL per gallon could be produced. The remaining regular grade gasoline, 80 per cent by

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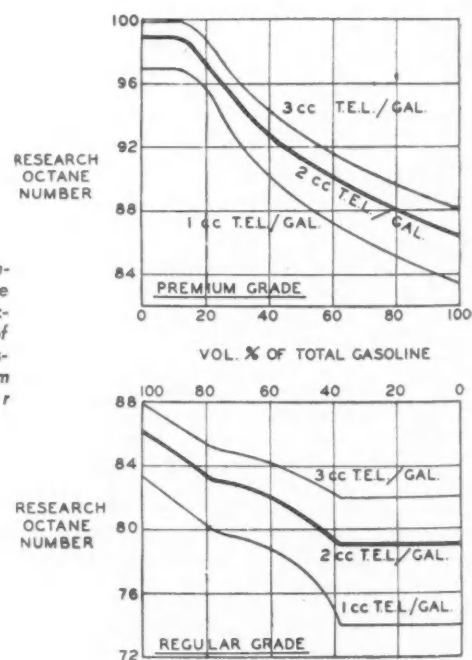
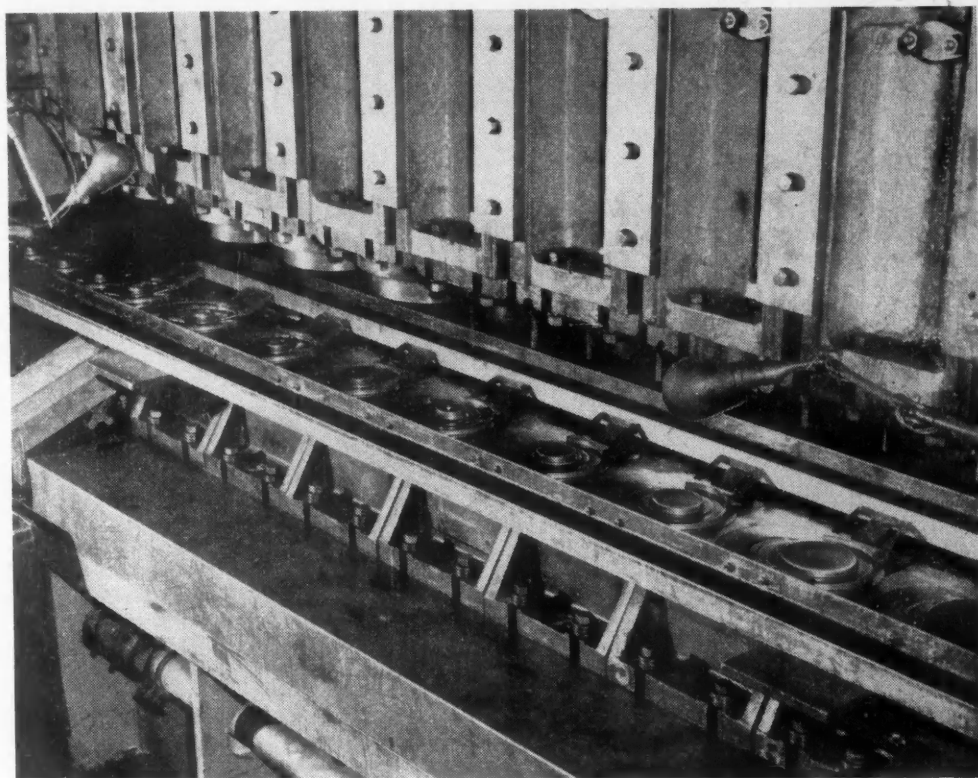


Fig. 5—Relationship between the volume and octane number of present day gasoline, premium and regular grades.

Close-up of working stations of nine-station Verson press described in the text. Blanking is done at the first station at the extreme right, strip stock being fed by automatic feeding rolls. The rails of the transfer mechanism may be seen on front and back sides of the stations with grasping fingers which are plainly seen in the background.



## Automatic Transfer Method for Stamping Parts at High Rate

CONSIDERING the spectacular growth of automatic transfer machines in the automotive industries, it is of interest to find that AC Spark Plug Div., General Motors Corp., has made considerable progress in the utilization of press transfer lines for high production parts. At the present writing AC has nine big presses set up for making stampings by the transfer technique, one of the largest units being the 500-ton Verson press, illustrated here.

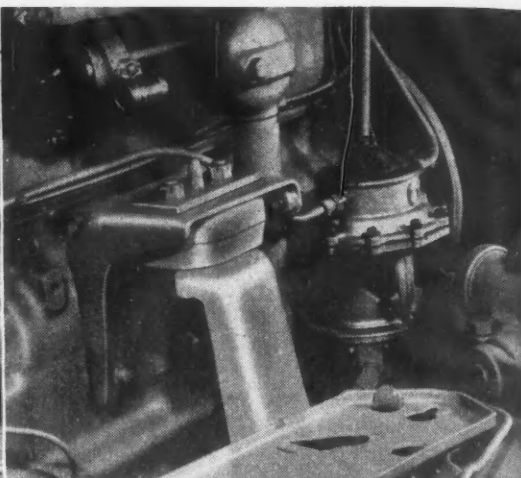
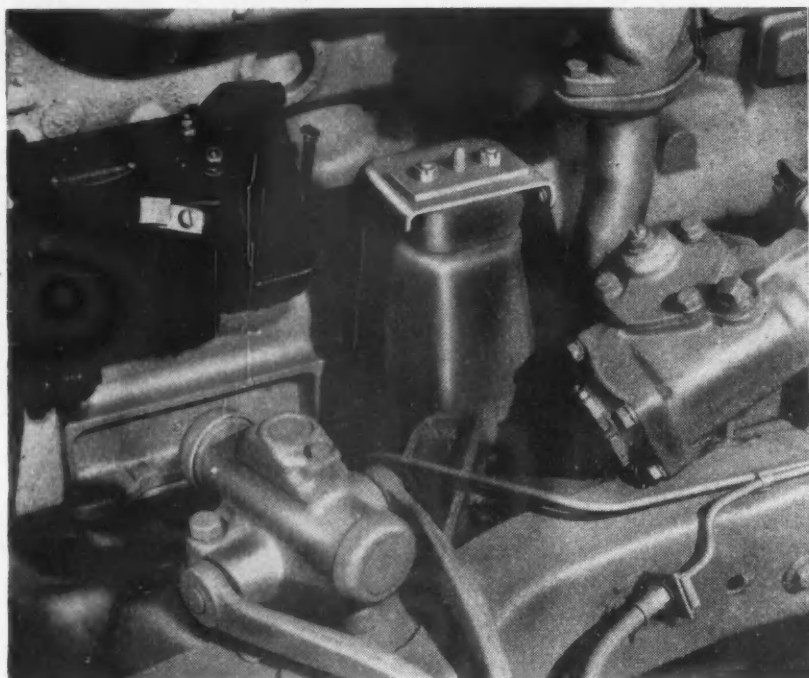
This press is of narrow bed construction, 138 in. long, and accommodates nine stations for the transfer operation. Each of the stations is equivalent to a conventional press operation, even using the same tools that would be set up in a conventional press. It is currently producing the element retainer for silencers which is made from strip stock handled in coils and fed into the first station for blanking by means of an automatic feed attachment.

A feature of the machine is its mechanically-operated transfer mechanism. Briefly, the transfer mechanism consists of two longitudinal rails arranged along the bed on each side of the work stations. Attached to these rails are suitably formed work-grasping fingers, spaced exactly on the centers of individual

stations. At the completion of the downward stroke of the press ram, and as the ram is on its upward stroke, the transfer mechanism moves the rails inwardly to grasp the work at each station, raises the rails so as to move the work up and out of the die, then advances the rails longitudinally one station. At the end of this maneuver the rails are moved outwardly to release the work at the proper station and returned to their original position longitudinally. With each cycle of the transfer mechanism, a finished piece is ejected, a blank is moved into a forming station, the intermediate operations being performed in continuous sequence.

According to the management, the transfer press method holds promise of worthwhile economy in the stamping of parts required in large quantities. For one thing the total cost of equipment is considerably less than the equivalent number of single presses. Then too each multiple station machine requires only a single operator. In addition, it is estimated to yield a saving in raw material ranging as high as 12 per cent compared with the utilization in progressive dies which have been considered most economical with respect to scrap up to now.





*(Left) New front engine-mount, left side, showing relationship to steering gear and front shock absorber.*

*(Above) Right side showing location of new engine mount.*

# Buick Reveals Design of New Dynaflow Transmission

**First Mechanism of Its Type in Passenger Car Field, the Dynaflow Combines Hydraulic Torque Converter, with Planetary Gearset and Is Offered as Optional Equipment on Roadmaster. 1948 Buicks Are Equipped with Newly-Developed Controlled Frequency Engine Mountings.**

**By Joseph Geschelin**

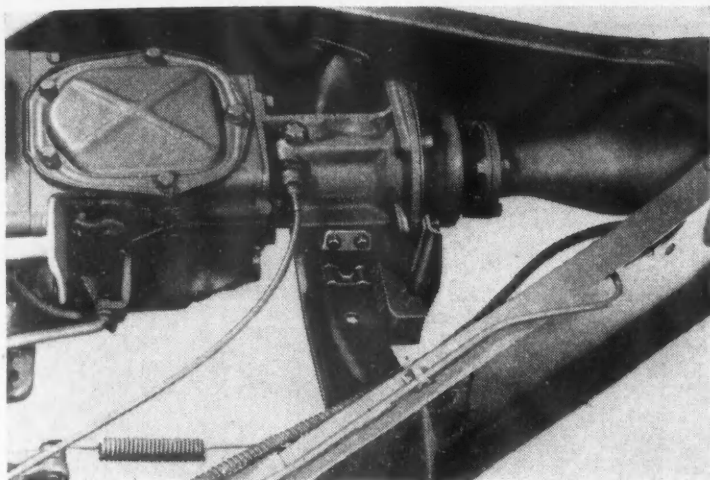
**T**HE most noteworthy feature of the Buick Motor Division announcement of its line for 1948 is the introduction of the unique Dynaflow transmission which is offered as optional equipment only on the Series 70 Roadmaster model. This transmission is of the hydraulic torque converter type, and is patterned after the Torqmatic transmission used in the Hell-Cat tank destroyers built by Buick during the war.

Although basic specifications remain unchanged, Buick offers its Series 40, 50, and 70 with a number of modifications. Among the most important of these are: new controlled frequency engine mountings; adoption of new tire sizes on Series 50 and 70; and an important change in piston rings.

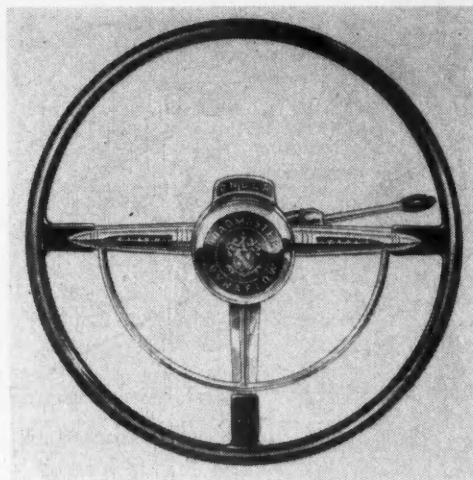
## **Few Engine Changes**

The engine on all three lines remains substantially the same as for 1947 except for a slight modification required to accommodate the controlled frequency engine mountings. This also carries with it a change in throttle control linkage parts and carburetor control lever, along with incidental pipe changes. The air cleaners remain the same except for a new elbow.

Compression ratio on the Series 50 has been stepped up to 6.6 to 1. The Series 70 engine with conventional transmission will continue a compression ratio of 6.6 to 1; but this is increased to 6.9 to 1 on engines used with the Dynaflow transmission. In addition for Dynaflow installation, the engine is fitted with a new crankshaft and a new flywheel.



Rear engine mount, composed of two separate sections, is located under the rear end of the transmission and mounted on the crossmember.



Position of the Dynaflo control lever under the steering wheel.

The other major change is the adoption of the Thompson Products "U-Flex" oil control ring which is used as the third ring in the four ring belt. In addition, the bottom oil control ring has been modified slightly in form to provide "quick-seating" characteristics. Along with these ring changes, the Parco-Lubrite cylinder bore treatment is eliminated.

### Improved Ride

The front suspension system on Series 40 and 50 cars is modified by the use of higher springs to provide increased clearance. The stabilizer bar on all models is continued unchanged save for the adoption of split bushings which change the design of bushings and brackets. On the 40 and 50, shock absorber valving is changed to improve ride and handling.

Rear axle and suspension system on the 40 and 50 remains unchanged and continues the optional 4.1 to 1 rear axle. The 70 axle ratio remains 4.1 and offers as an option the 3.6 to 1 rear axle both on conventional and Dynaflo equipped cars. The standard rear axle offered with Dynaflo transmission has a gear ratio of 3.9 to 1. Brakes and controls also remain unchanged, and the same is true of the chassis frame, except for detail changes required to accommodate the controlled frequency motor mounts.

The standard transmission remains the same except for modification for the new rear engine mount. On the 40 and 50, the rear bearing retainer is the same length as on the 1947 Series 50 with modification for the rear motor mount. On the Series 70 the Dynaflo transmission is offered as optional equipment.

The electrical system remains as before except for slight modifications. For example, the battery cables and battery support are changed to accommodate the new engine mounts. Instruments and clock remain the same, except for a scratch-brushed aluminum finish and aluminum targets. The directional signal switch housing is new, but the switch and wiring are unchanged. The wiring harness is changed to take con-

nections for the two back-up lights offered as optional equipment on all models.

Steering gear arrangement remains the same on all models. The same is true of the fuel tank and exhaust system, except that on the Series 40 the tailpipe is changed to provide more frame cross-member clearance.

Buick retains the wide rims first introduced on the Series 40 in 1941, and on the new Series 40 retains the same tire sizes used heretofore. On the Series 50 and 70 new tires have been adopted, the 50 being equipped with 7.60-15 and the 70 with 8.20-15. Both sizes are mounted on 6½ in. rims. These new sizes make possible the use of slightly lower pressures.

A new three-spoke flexible steering wheel that leaves the upper half of the wheel entirely unobstructed is being introduced on the Series 50 and 70. It carries a newly designed monogram bearing the series designation as well as a new semicircular horn ring that fits into the wheel's three spoke design. This wheel is also offered as optional equipment on the Series 40.

Interior trim, trim styling and body paint are new on all models. All models have a dash mat of Celotex construction; while the 50 and 70 also have a new roof insulation. On the 70 the floor pan opening is pierced to accommodate the Dynaflo transmission and a new floor mat will be supplied when Dynaflo is specified.

### New Engine Mountings

The new controlled-frequency engine mountings were developed using a special engine-mount testing machine described in the May 1, 1947, issue of *AUTOMOTIVE INDUSTRIES*. Fundamentally their design is based on the fact that a motor car is a vibrating system that can be treated much the same as any vibrational problem. The engine mounts are designed so that the frequency of the engine on its mountings eliminates or damps other vibrations induced by either the engine or road irregularities. The location of the mountings and the material used for their construction are the two basic factors responsible for the re-

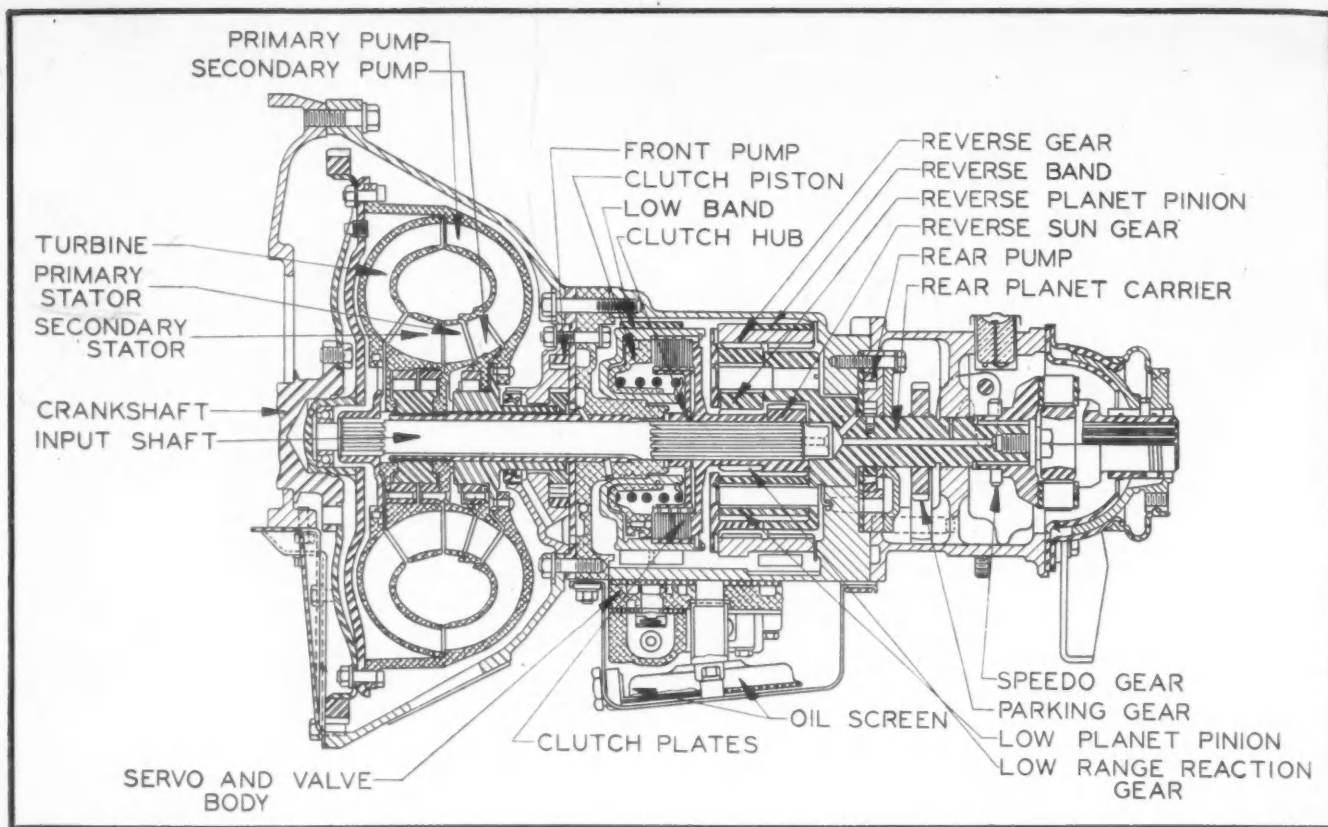


Fig. 1—Longitudinal cross-section through Dynaflo transmission.

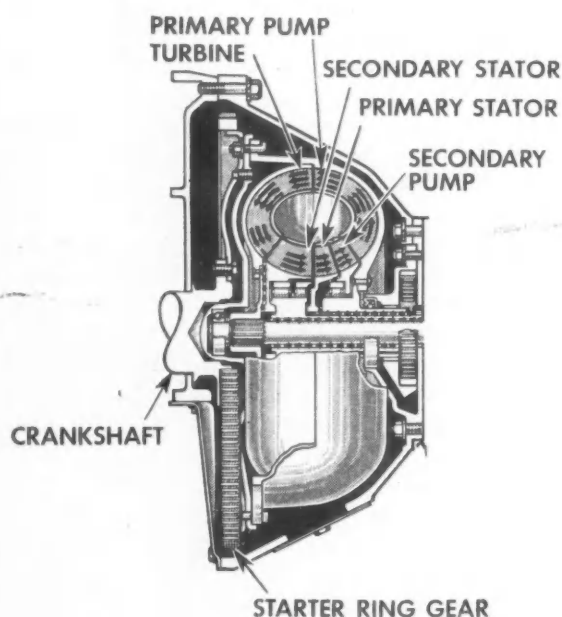


Fig. 2—Cut-away drawing of the Dynaflo torque converter.

sults thus achieved with the design.

The new mounting is a three-point system with two front mounts and a rear mount. The latter is composed of two pieces located at the torque tube ball joint—one to support a portion of the weight of the engine and transmissions, the other to take the thrust drive from the rear wheels. Stemming from research conducted during the war, Buick found that synthetic rubber of the GR-S composition has the inherent fric-

tional qualities desired in a damping mechanism, and this type of material is used in the 1948 mountings. It provides the damping quality formerly achieved only through the use of special mechanical frictional devices.

#### Dynaflo Transmission Mechanism

The Dynaflo transmission performs its functions automatically and yet, unlike most automatic devices, it is completely responsive to the will of the driver through manual control. Its action is smooth and continuous and without any impression of gear changes. In fact, for normal operation there is no shifting of gears since the system does not require the conventional clutch pedal, the pedal has been eliminated. At the same time the brake pedal has been shifted laterally to facilitate its operation with the left foot. The right foot can then remain on the accelerator pedal at all times.

Manual control of transmission maneuvers is by means of a control lever mounted below the steering wheel, its quadrant having five positions as follows:

- "P" for parking
- "N" for neutral
- "D" for direct drive
- "L" for emergency low
- "R" for reverse

For driving under most operating conditions the shift lever is moved to the "D" position and requires no further attention. Emergency low is used only under extreme driving conditions, or when operating in heavy snow, mud or sand where a low reduction is required. However, a shift from direct to low or



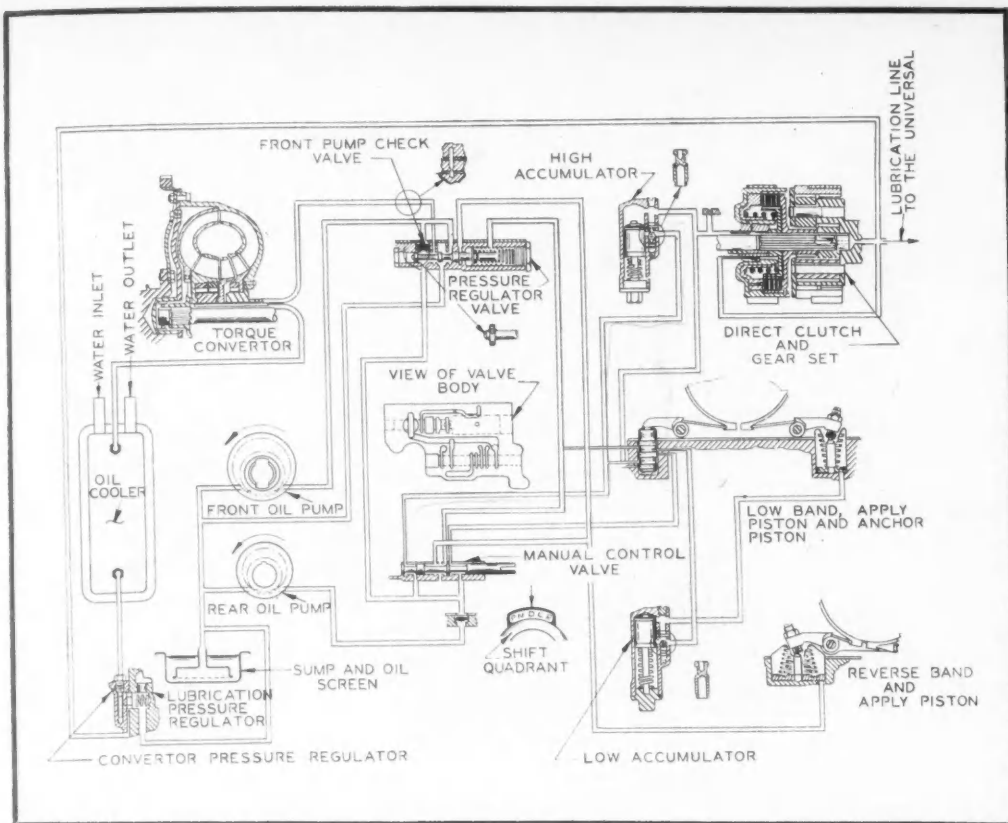


Fig. 4 (Left) — Dynaflow power flow diagram for driving range below 45 mph.

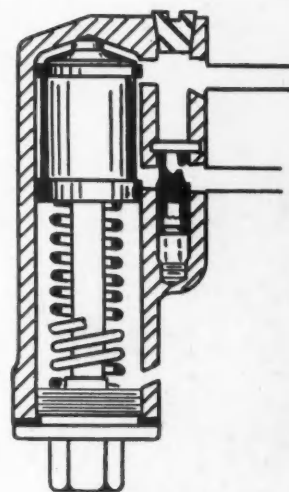


Fig. 5 (right) — Position of the high accumulator for low range and starting. Other elements in the system are similar to those of Fig. 4.

vice versa can be made simply by moving the control lever without any other attention on the part of the driver. Similarly the shift from direct or low can be made into reverse at low speeds simply by moving the lever. Reverse requires lifting the lever upward to go over the safety lock. On the other hand, if the car is in trouble in snow or mud or in a chuck hole where it is necessary to "rock" the car to get it out, quick shifts can be made from direct to reverse and vice versa without injuring the mechanism.

If the battery is down and a push start is required, it is recommended that the car be left in neutral until

it is accelerated to around 30 mph, then placed in direct drive. At this speed a rear transmission pump takes hold from the drive end and supplies the necessary pressure to start the engine. Emergency low can be used to obtain engine braking on heavy grades in the same manner as conventional second gear operation.

The parking gear is an additional safety feature with the Dynaflow, and permits locking of the drive when parked on grades. The lock is mechanical and is energized by a linkage to the transmission from the "P" gear shift lever position.

For direct drive the planetary gear set is locked in direct by means of a multiple-disc clutch operated by an hydraulic piston. Low and reverse are controlled by brake bands lined with a sintered metallic friction lining.

When operating as a torque converter, the unit is capable of torque multiplication equivalent to a gear ratio of approximately  $2\frac{1}{4}$  to 1 through the operation of reaction blades. This torque multiplication is the same as a standard Buick Series 70 transmission.

As illustrated in Fig. 1, the Dynaflow transmission  
(Turn to page 56, please)

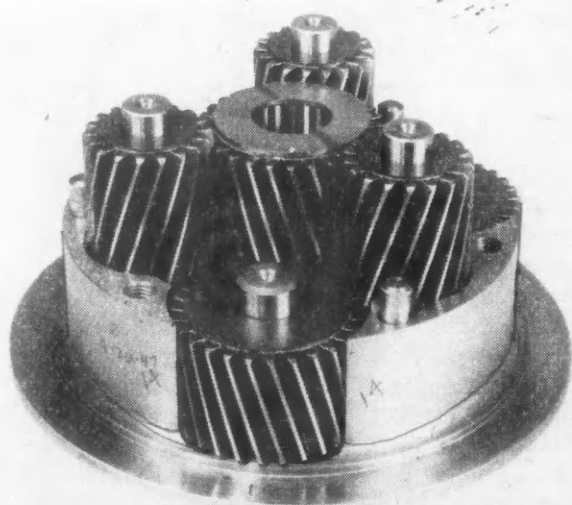


Fig. 3—Dynaflow planetary gear set assembly.

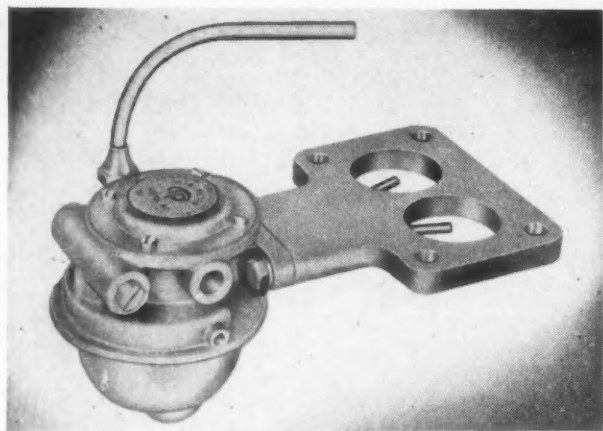
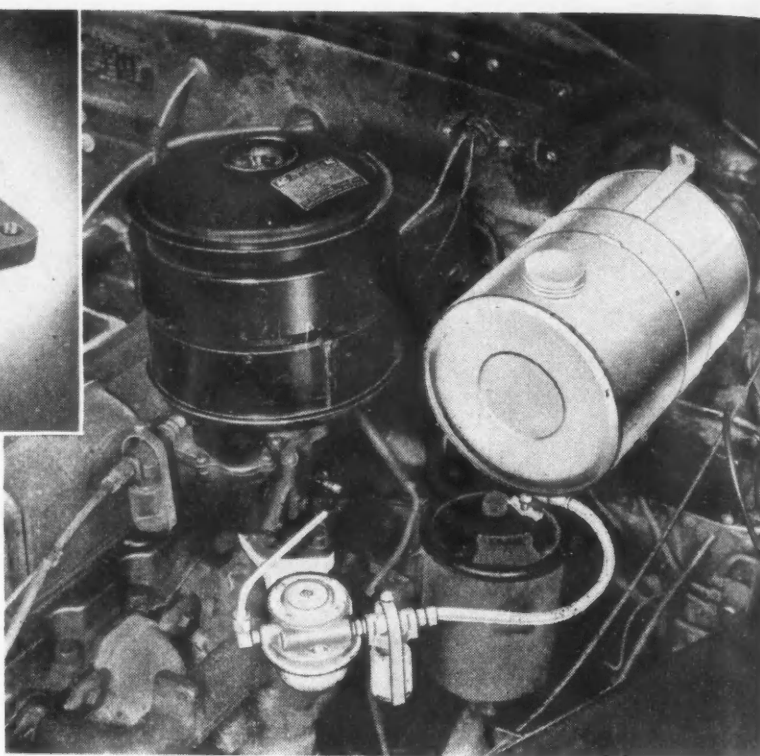


Fig. 1—Vita-Meter equipment installed in passenger car; the Vita-Meter is shown in the inset.



# Knock-Free Engine Operation on Low-Octane Gasolines

**Injection of a Knock-Suppressing Liquid Makes Use of High Burning Quality Fuel Practical in Fleet Vehicles. Important Savings on Fuel Costs and Engine Maintenance Claimed.**

**By P. M. Heldt**

**D**URING the war considerable research and experimental work was done on the effects of water and alcohol injection into aircraft engines in suppressing detonation when operating under extreme conditions, as during take-off, steep climbs, etc. Quite satisfactory results were obtained, and the method has come into extensive use in the aircraft field. Several engineering papers and reports on the subject have been published since then, and it has been shown that not only can the maximum power of the engine be materially increased, but the rate of fuel consumption in cruising operation is reduced.

It has long been known that water inducted or injected into an engine has a detonation-suppressing

effect, and also that alcohol is a fuel of high anti-knock value. In the past numerous water-injection and steam-induction devices have been offered the motoring public with the claims that they would render engine operation smoother, increase engine power and fuel economy, and reduce or eliminate carbon deposits. That none of these appliances achieved lasting success can be accounted for on several grounds. In the first place, really beneficial effects from water injection can be expected only under operating conditions which without such injection would cause detonation, and most of the earlier devices fed water to the engine under *all* operating conditions. With the engine idling or under light load the intro-

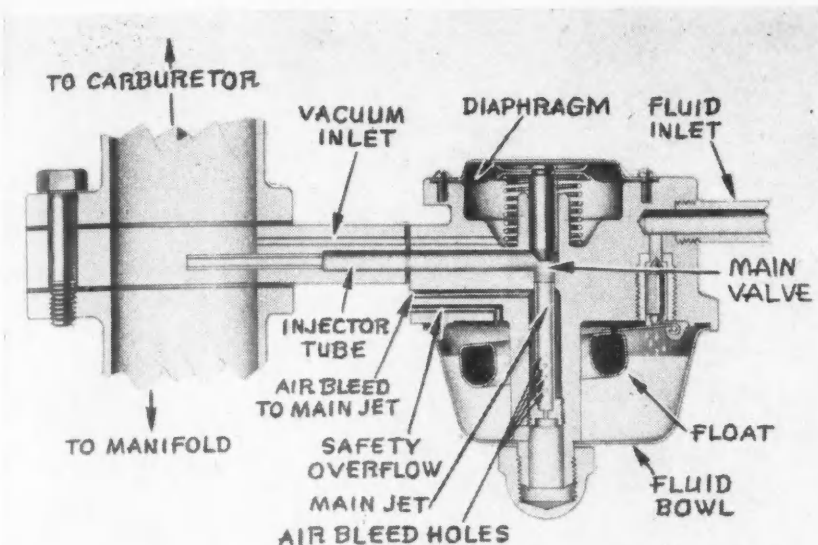


Fig. 2—Cross-section view shows Vita-Meter unit with throttle in wide-open position. Low vacuum has permitted diaphragm to be forced up by spring, opening main valve and permitting flow of injection fluid from bowl, through main jet and injector tube, to manifold. Air bleed holes in jet automatically increase percentage of air as engine speed increases. Fluid enters at right and is controlled by float. As throttle closed, vacuum is built up under diaphragm pulling it down and closing main valve, thus preventing flow of injection fluid. Spring tension and jet may be tailored to requirements of individual engines.

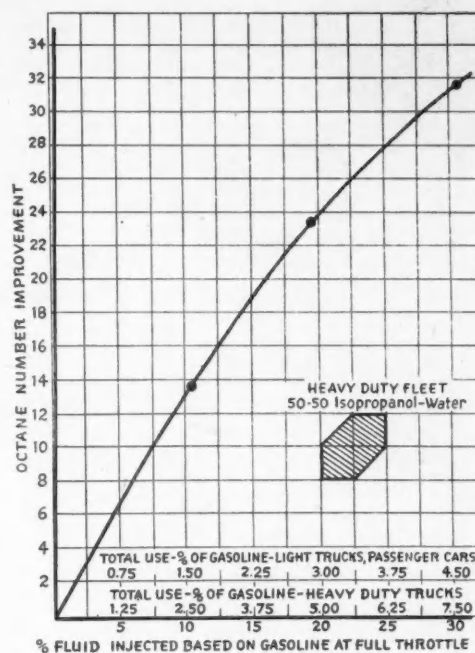


Fig. 3—Anti-knock Value of Vitol as shown by road tests.

duction of water to the cylinders is almost sure to have harmful effects, because water in the liquid state promotes corrosion of any ferrous surfaces with which it may come in contact. The injection equipment itself, if not properly designed, is apt to give trouble from corrosion and clogging. It may be pointed out in this connection that any such detonation inhibitors as water and commercial alcohol cannot be introduced with the fuel (as tetraethyl lead is, for instance) but must be fed separately, because a solution of the two is practically insoluble in gasoline.

It is obvious from the foregoing that the use of water and alcohol for the purpose calls for the solution of a number of problems, such as that of the best composition of the fluid, the engine operating range over which injection should take place, the proper dosing of the anti-detonant fluid within this range, and prevention of deleterious effects of injection, such as corrosion and clogging or plugging of the injection apparatus. All of these problems were studied during the war and subsequent to it, and it is understood that satisfactory solutions have been found.

The hope has often been expressed that the great efforts made in the scientific research field during the late war would yield results that would prove of benefit in civilian life during the postwar period, and this hope seems about to be realized as regards research on the injection of anti-detonant fluids in combustion engines. Thompson Vita-Meter Corp. of Cleveland has worked out a program whereby it expects, with the cooperation of the petroleum and automotive industries, to make injection equipment and anti-detonant fluid available to fleet operators under conditions that will enable these operators to effect considerable savings on their overall costs. An injection device for motor vehicles, known as the Thompson

Vita-Meter, was designed during the war period, and has since been further improved from the standpoints of operating reliability and ease of production. Experience with a considerable number of these devices is said to have shown that it is fully automatic and requires no more maintenance than an ordinary carburetor. Fig. 1 shows the Vita-Meter equipment installed in a passenger car; the inset is a photographic view of the Vita-Meter.

The anti-detonating fluid, known as Vitol, is composed of water, alcohol, and tetraethyl lead. There are two ways open for utilizing the anti-knock quality contributed by this solution. One would be to use it with currently sold premium gasolines to gain 100 octane performance from engines designed for that quality fuel. These gasolines have about 85 octane rating and tests with such gasolines and three high compression ratio engines showed a response from the anti-detonant injection that gave results over those with 100 octane gasoline. The new method presents a possibility of solving the fuel problem for high compression engines such as the Kettering 12.5 CR engine.

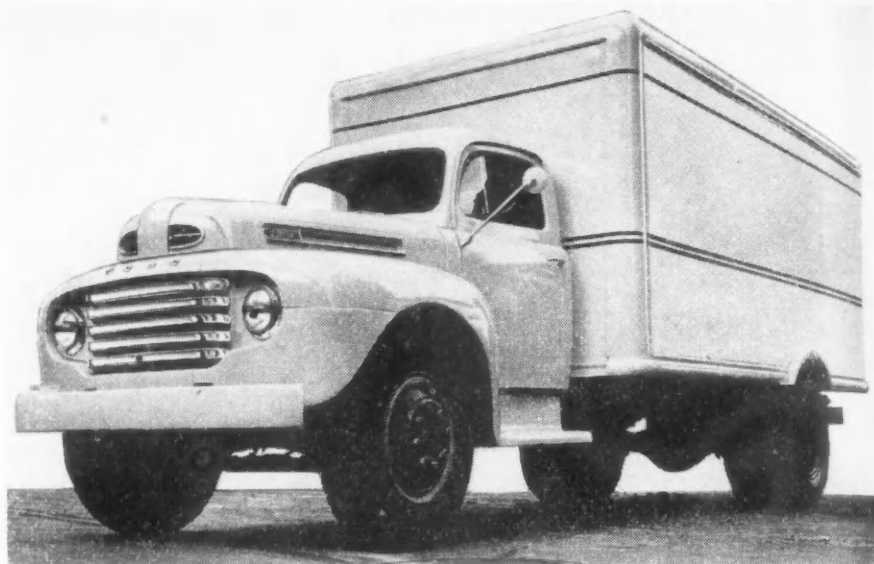
To gain the maximum advantages from injection of Vitol in present day engines, it is to be used together with a special grade of straight-run gasoline which fleet owners might obtain in tank-truck loads directly from the refinery. This would eliminate the problem of the distribution of an additional grade of motor fuel through filling stations.

One reason for the proposed use of straight-run instead of cracked, reformed, or blended fuel is that it can be produced at somewhat lower cost. Besides, many straight-run fuels are said to have better burning qualities. This latter term is not used very often outside the circles of petroleum technologist and may

(Turn to page 68, please)



It has a GVW rating of 21,500 lb and is powered by the new Rouge 145 hp V-8 engine. Equipment includes a five-speed transmission and two-speed spiral bevel full floating rear axle. Back of cab to C/L rear axle dimension is 121.06 in. and back of cab to end of frame dimension is 181.06 in.



## Ford Expands Truck Line with Two Extra-Heavy-Duty Models

**2½-Ton and 3-Ton Trucks of 19,000 Lb and 21,500 Lb GVW Ratings Will Be Powered by Newly-Designed Rouge 145 Hp V-8 Engine. Redesigned 95 Hp Six and 100 Hp V-8, New C-O-E- Six Series, Cab Improvements, and New Front End Appearance Are Also 1948 Features.**

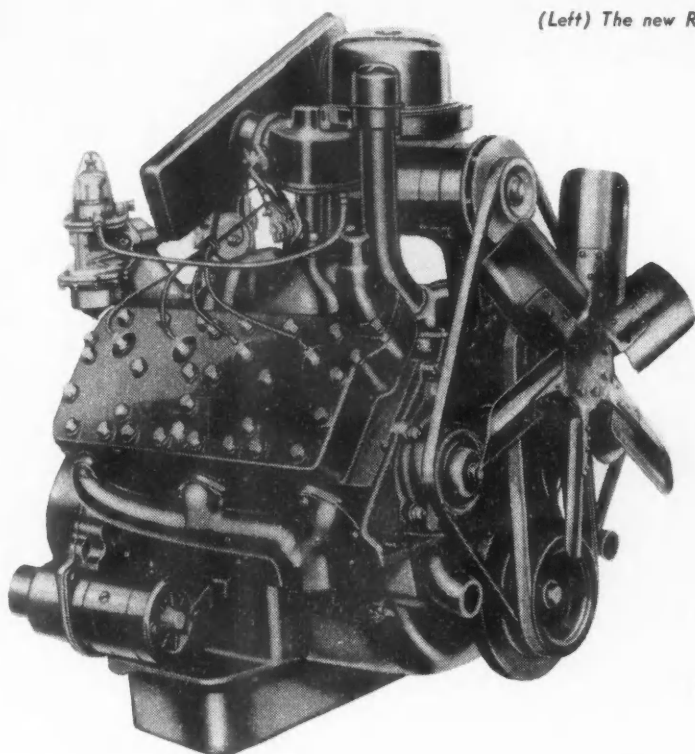
1948 FORD TRUCK WHEELBASE												
Wheelbase	F-1	F-2	F-3	F-4	F-5 & F-6		F-5 C.O.E. F-6 C.O.E.			F-7 & F-8		
Inches.....	114	122	122	134	134	158	110	134	158	135	159	195
Dimensions (inches)—												
CA—Back of Cab to C/L Rear	40.06	48.06	48.06	60.06	60.06	84.06	60.06	84.06	108.06	61.06	85.06	121.06
CE—Back of Cab to End of	75.87	96.06	96.06	96.56	98.56	122.56	98.56	122.56	146.56	112.3	136.3	181.06
Frame.....												



The 1948 Series F-1 Ford ½-ton truck has a 114-in. wheelbase with 6½-ft pickup body. Note the new appearance of the front end sheet metal.

**T**WO NEW Extra-Heavy-Duty models with maximum GVW ratings of 19,000 lb and 21,500 lb, a brand new 145-hp V-8 engine with Zero-Lash hydraulic valve lifters and a modern but functional "new look" with added features for driver comfort carried throughout the line highlight the long-awaited 1948 Ford trucks. Supplementing this trio of innovations are such added attractions as the redesigned 95-hp six and 100-hp V-8 engines, a number of new cab features which put emphasis on driver comfort, numerous improvements throughout the chassis, and a new six-cylinder C-O-E series.

The line is divided into three categories:



(Left) The new Rouge 337 V-8 engine that develops 145 hp and 255 lb-ft of torque.



Cab interior of the new six-cylinder cab-over-engine model showing how redesigning has provided larger area of clear floor space.

#### 1948 FORD TRUCK ENGINE SPECIFICATION TABLE

	Rouge 226 Truck Six	Rouge 239 Truck V-8	Rouge 337 Truck V-8
Type	6 cyl. L-head	V-8, 90° L-head	V-8, 90° L-head
Bore	3.300 in.	3.1875 in.	3.500 in.
Stroke	4.400 in.	3.75 in.	4.375 in.
Displacement	226 cu in.	239 cu in.	337 cu in.
Max. Brake Horsepower	95 @ 3300 rpm	100 @ 3800 rpm	145 @ 3600 rpm
Max. Torque	180 lb-ft @ 1200 rpm	180 lb-ft @ 2000 rpm	255 lb-ft @ 1800 rpm
Comp. Ratio	6.8 to 1	6.8 to 1	6.4 to 1
Crankshaft	4-brg. counterbalanced	—3 brg. fully-counterbalanced, 90° throws—	Viscous
Vibration Damper	Viscous or rubber bonded	None	Viscous
Main bearings	4	3	3
Connecting rod bearings	Precision, steel-backed, copper lead	Aluminum alloy, cam ground, split skirt, oval type with steel struts	Alumilited, tin or zinc plated
Pistons	Silchrome	High chrome-alloy steel	Silchrome
Finish	High chrome-alloy steel	High chrome-alloy steel	Silchrome-hard faced
Valves—Intake	Adjustable-self-lock screw	Pre-set hollow steel	Zero-lash hydraulic
Exhaust	Exhaust	Intake and exhaust	Exhaust
Lifters	30-33 amp, 230 watts	30-33 amp, 230 watts	40 amp, 280 watts
Seat inserts	5 qts	5 qts	10 qts
Generator	4-blade, 17 in. dia	4-blade, 18½ in. dia	6-blade, 20 in. dia
Crankcase capacity			
Fan			

The distributor is mounted at the top rear of the engine and features a full-automatic advance entirely controlled by vacuum. It is of rugged design, said to give exceptionally long point life. The metal-clad coil is mounted directly adjacent to the distributor.

The eight-port, duplex, horizontal-plane intake manifold is integral with the valve cover. Exhaust valves are of Silchrome with hard facing while exhaust valve seat inserts are of molybdenum chrome alloy. Small diameter, one piece, removable-type valve guides are provided for good cooling and long life. Valve springs are shot-

the Light-Duty Series F-1, F-2, F-3, F-4; the Heavy-Duty Series F-5 and F-6; and the Extra-Heavy-Duty series F-7 and F-8. Included in the Heavy Duty category are the F-5 C-O-E and the F-6 C-O-E Series. Basic data are shown in the accompanying tables.

#### New 145-Hp V-8

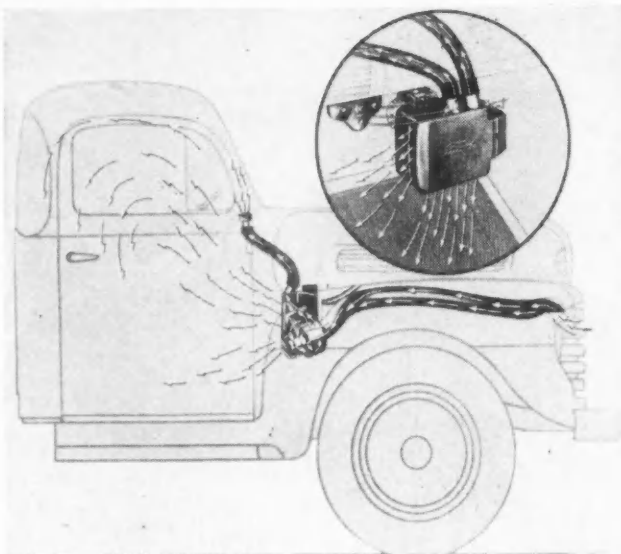
The new 145-hp 337 cu in. engine is unlike any engine previously offered by Ford. It is a 90-deg V-8 fitted with zero-lash hydraulic valve lifters and a dual concentric downdraft carburetor with all metering jets and passages in the center of the float bowl providing correct metering of fuel at all operating angles. An interesting feature is the provision for a vacuum-type governor integral with the carburetor and having a separate engine-driven rotor control.

blasted and rust-proofed.

Cylinder blocks are of Ford alloy cast iron with controlled micro-finish cylinder walls. Cylinder heads also are of cast alloy iron with turbulent-type, high-compression combustion chambers. Compression ratio is 6.4 to 1. Aluminum alloy pistons have four rings each, the top compression ring being chrome-plated for better lubrication and longer cylinder life.

Crankshaft is of drop-forged steel with flame-hardened journals and fitted with a viscous-type vibration damper. Main bearings are of the steel-backed replaceable-type with lining of special bearing alloy. Connecting rod bearings are steel-backed with a lining of copper-lead alloy.

The oil pump is of large capacity and driven from the rear of the camshaft. Two relief valves are pro-



A three-way air-control system ventilates the cabs of all 1948 model Ford trucks. A concealed, screen protected opening just above the recessed headlight in the right front fender admits fresh air for an air conditioning system available as extra equipment. This provides heating and defrosting in cold weather, helps to keep windows clear in mild weather and can be used at all times to draw fresh air into the cab in regulated volume.

vided, one in the pump, the other in the front end of the block.

The water outlet is at the front of each cylinder head, designed for series-flow cooling. The two high-capacity pumps of centrifugal type with curved blade impellers are packless and self-lubricating. There is a recirculating type temperature control with thermostat in each outlet.

### The 95-Hp Six

The completely redesigned 95-hp six-cylinder truck engine has many noteworthy new features. The distributor is mounted on the left side of the block and, in common with all new Ford engines, has a fully-automatic advance mechanism controlled entirely by vacuum. The coil is directly adjacent to the distributor. A single downdraft carburetor is provided on

Adding to driver comfort in the cab-over-engine models is a lounge-type seat floated on a variable rate coil spring, adjustable to the driver's weight. Standard equipment on C-O-E models, the seats also are available for conventional trucks.



conventional models and an up-draft version on the C-O-E series.

The rotary-type oil pump is now mounted externally on the right side of the upper crankcase and has a capacity of 50 psi at 2000 rpm. The oil filter of full-flow type is integrally-mounted at the left rear of the block and has no external oil lines. An oil relief valve is mounted ahead of the filter for protection.

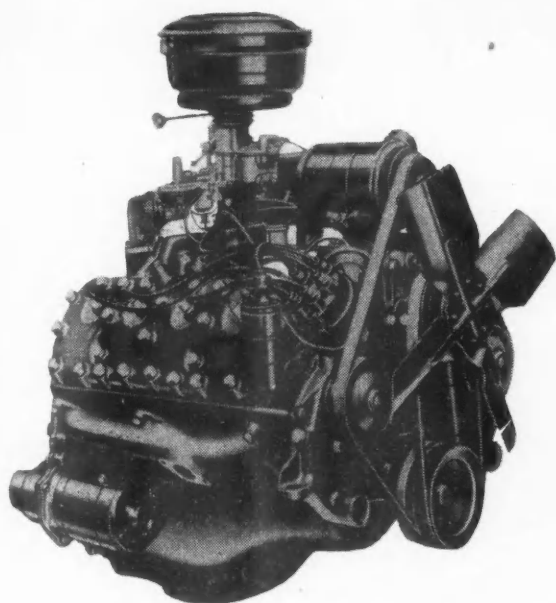
The new intake manifold has been engineered for improved performance and to speed up cold weather starting. Intake valves are of Silchrome while exhaust valves are of high chrome alloy steel with valve seat inserts of molybdenum chrome alloy. Valve lifters are of adjustable self-lock screw type and long, small-diameter, pressed-in valve guides are provided for better cooling and longer life. In addition, the center line of the valves has been moved out to increase the water passage around the valve guides.

The camshaft is of high-lift type providing for greater performance.

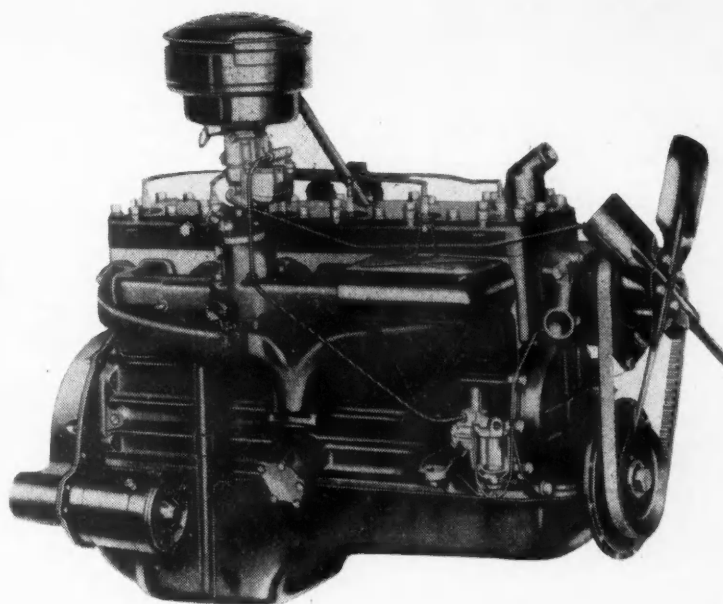
### 1948 FORD TRUCK CONDENSED SPECIFICATIONS

SERIES	F-1	F-2	F-3	F-4	F-5	F-5 C.O.E.	F-6	F-6 C.O.E.	F-7	F-8
Nominal Rating	1/2-Ton	3/4-Ton	3/4-Ton H.D.	1-Ton	1 1/2-Ton	1 1/2-Ton	2-Ton	2-Ton	2 1/2-Ton	3-Ton
Gross Vehicle Weight Rating (Max.)	4700 lb	5700 lb	6800 lb	7500 lb (Single Tires)	14,000 lb	14,000 lb	15,500 lb	16,000 lb	19,000 lb	21,500 lb
(Obtainable with required chassis equipment)				10,000 lb (Dual Tires)						
Rear Tire Size for Max. G.V.W.	6.50-16-6 ply	7.50-16-6 ply	7.50-17-8 ply	7.00-20-8 ply single 7.00-18-8 ply dual	7.50-20-8 ply dual		8.25-20-10 ply dual		9.00-20-10 ply dual	10.00-20-12 ply dual
Engines Available	95 hp Truck Six or 100 hp Truck V-8				100 hp Truck V-8 or 95 hp Truck Six				145 hp Truck V-8	
Axle, Rear—Type	Hyphoid-1/2-Fl.				Spiral Bevel Quadraz, Full Floating				2-Speed Quadraz Spiral Bevel Full-Floating	
—(Ratios)	3.73/4.27	4.86	5.14/5.83	6.67/5.83/5.14	5.83/8.11	6.80	6.50/8.87			
Brakes, Service—Size, Front	11 x 2 in.	12 x 1 3/4 in.	14 x 2 in.	14 x 2 in.	15 x 3 1/2 in.	16 1/4 x 3 1/2 in.	16 x 5 in.			
—Size, Rear	11 x 1 3/4 in.	12 x 1 3/4 in.	14 x 2 in.	14 x 2 in.	15 x 3 1/2 in.	16 1/4 x 3 1/2 in.	16 x 5 in.			
Total Lining Area, Sq. In.	178	167	188	302	302	350	485			
Vacuum Power Bkg., Type						Diaphragm Type	Piston Type			
Clutch (Gyro-Grip) Diameter	10 in.			11 in.	11 in.	11 in.	12 in.			
Friction Area, Sq. In.	85.5			123.7	123.7	149.2	20.5 to 1			
Steering Gear—Ratio		18.2 to 1		20.4 to 1	20.4 to 1	20.5 to 1				
Transmission—Type	3-Sp. Hel. Syn.			Four Speed Sliding Gear	Four Speed Sliding Gear	5-Sp. Hel. Over Drive	5-Sp. Hel. Direct Drive			





The improved 100-hp V-8 Ford engine. Accessories are mounted on top of the unit for convenience in servicing.



The completely redesigned 226 truck six-cylinder engine. It develops 95 hp and 180 lb-ft of torque.

The flywheel is attached to the crankshaft flange with self-locking bolts and a viscous or rubber-bonded vibration damper is fitted at the front and marked to facilitate timing.

#### The 100-Hp V-8

The most easily detected new features of the improved 100-hp V-8 are the relocation of the distributor at the right top front of the engine, the directly adjacent coil, and the exposed high-tension wiring which is no longer contained in conduits. The distributor is gear driven and advance is controlled by vacuum action.

Other new features include a detachable flywheel housing, flywheel attached to crankshaft with self-locking bolts, one-piece valve guides and a redesigned intake manifold. The two water pumps have greater capacity and new water outlets at the front of the heads permit use of non-molded hose. The oil filler has been moved to the top front of the engine and a breather outlet near the filler is fitted with a long suction pipe. The generator has greater output, cuts in at lower speed and features a new easily accessible mounting. A pointer has been added to the engine front cover plate with marks on the pulley to facilitate timing.

#### Extra-Heavy-Duties

The new Extra-Heavy-Duty models F-7 and F-8 are rated at 19,000 and 21,500 lb maximum GVW respectively. In addition to the new 145-hp engine, these models have five-speed transmissions with the fifth speed overdrive on the F-7 and direct (overdrive optional) on the F-8. Both transmissions have constant-mesh helical gears in third, fourth and fifth speeds, engaged by sliding collars. Both have two-piece cases with separate clutch housing and power-take-off openings on both sides.

The F-7 has a single reduction, heavy-duty, hypoid, full-floating rear axle with split-type housing, pre-

cision fit of all assemblies, shim adjustment on the straddle-mounted pinion, extra-high-capacity wheel bearings, ring gear thrust block and four-pinion differential. The F-8 is fitted with a two-speed, vacuum-controlled rear axle of heavy-duty, full-floating type. This axle has a single spiral-bevel gear high-range reduction, and a supplementary spur-gear, planetary double-reduction in low range.

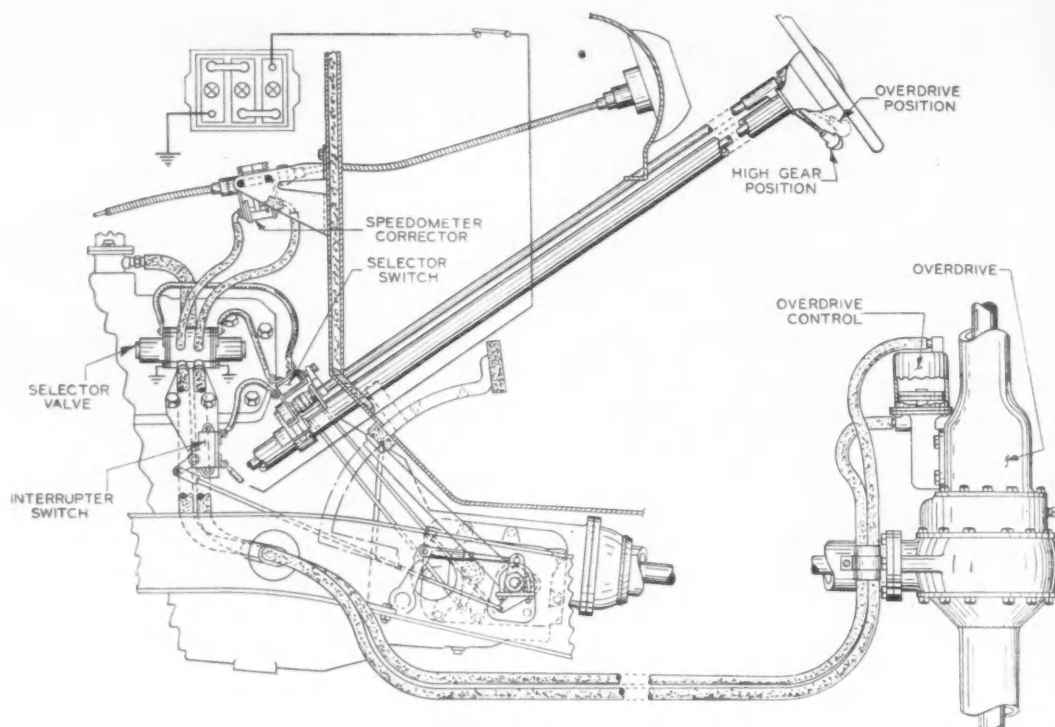
Brake drums on both the F-7 and F-8 are of the demountable type, the rear ones being readily removed without disturbing the hubs. Front drums are of centrifuse type, while rear drums are composite on the F-7, cast iron on the F-8. An inspection hole is provided for feeler gage check of brake adjustment. Vacuum power braking is standard on both models using a fully-sealed piston-type unit 9½ in. in diameter. The hand brake is a spring-loaded drum type at the back of the transmission on the drive line.

Steering on these models is the new worm and dual needle bearing three-tooth roller type. There is a solid-type drag link fitted with dust shields and adjustable stud, and a lock nut on the spindle arm serves as a steering stop.

New cab design and driver comfort features are common to all new models. The cabs provide up to 7 in. greater width and also more head-room. The door has been moved forward to provide better clearance when leaving and entering. Weather-proofing has been improved and the hardware is heavier. A distinguishing feature is a new three-way air control system for ventilating to provide "living room" comfort. A fresh air intake heater and defroster provides an efficient ram and blower heater to pressurize the cab for uniform heat distribution. In mild weather it reduces window fogging and is said to provide twice the usual volume of hot air to defroster vents. This is optional equipment at extra cost.

A concealed, screen protected opening just above the  
(Turn to page 74, please)

Fig. 1 — Schematic drawing of the Randol invention for overdrive control. Shifting to overdrive is accomplished by lifting the shifting lever to the overdrive position, as shown by the dotted lines, and by depressing the clutch pedal. Movement of the shifting lever preselects the overdrive, while action of the clutch effects the actual shift.



# Preselective Overdrive Control Combined with Shifting Lever

By Robert C. Mack

**A** PRESELECTIVE finger-lift type of overdrive control for passenger cars, developed by Glenn T. Randol of St. Louis, Mo., can be integrated with a standard transmission so that the regular steering-column gear-shift lever controls both the transmission and the overdrive auxiliary. This combination provides a preselective overdrive with transmission operating characteristics, which is claimed to result in improved fuel economy and less wear on the driving parts of the car, as well as increased use of overdrive in city and country driving without sacrificing engine performance.

This new overdrive control has been installed on a 1947 six-cylinder Ford equipped with a Columbia overdrive axle, and is currently undergoing thorough road tests. Similar installations for Mercury and Lincoln cars are under development, and the inventor hopes to have the finger-lift control available as accessory installation for all 1948 cars equipped with Columbia or Warner overdrives.

Basic components of the Randol overdrive control system for the Columbia axle, as illustrated in Fig. 1, consist of a modified steering-column gear shift actuator, an electric selector switch operated by the shifting lever, an interrupter switch operated by the clutch pedal, an overdrive control cylinder and piston actuated by intake manifold vacuum of the engine, and a selector valve for the overdrive control. The modified shifting lever, in combination with the interrupting switch feature on the clutch pedal, is utilized to actuate the various electrical and vacuum mechanisms to effect a power-operated shift to overdrive gear ratio. Overdrive position of the shifting lever is located slightly above the standard high-speed gear position. Thus, shifting to overdrive from high gear is accomplished by lifting or pulling the lever slightly towards the steering wheel, and then by depressing the clutch pedal. The movement of the shifting lever preselects the overdrive gear ratio by closing the selector switch to the selector valve. Depressing the clutch

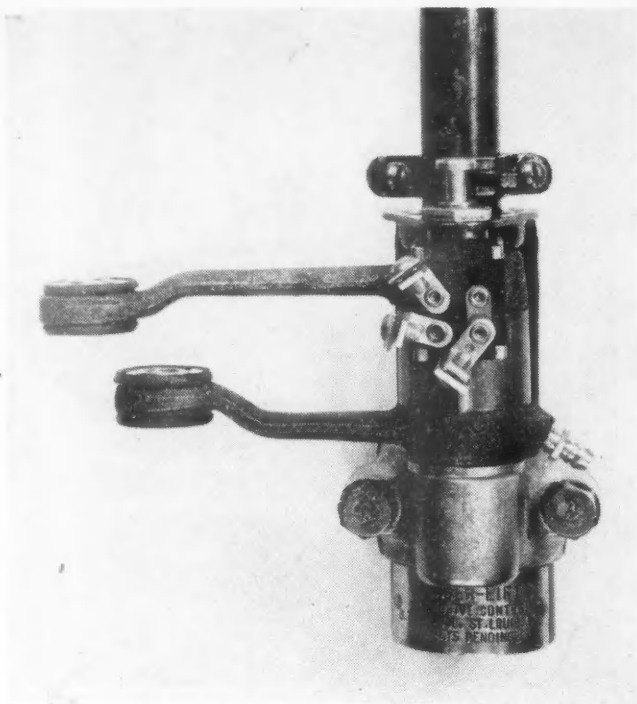


Fig. 2—Shift actuator of the Randal overdrive control. The three-terminal selector switch is mounted on top of the shift control shaft.

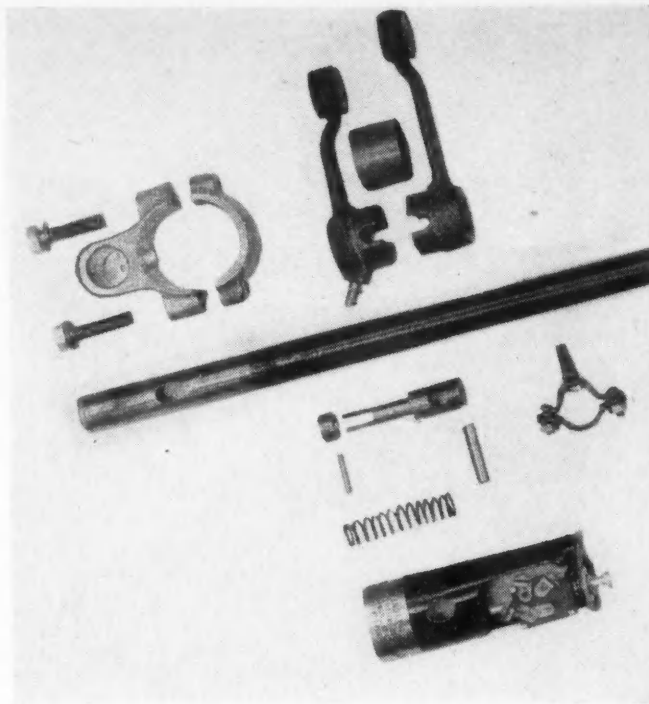


Fig. 3—Disassembled parts of the shift actuator, showing the cross-pin mechanism and the selector switch mounting.

pedal closes the interrupter switch in the battery selector-switch circuit, and overdrive engagement is effected through action of the selector valve and operation of the overdrive control cylinder.

### Steering Column Shift Actuator

The overdrive shift actuator, shown in Figs. 2 and 3, is a modified steering-column shifting lever which has been combined with an electrical switch for regulating the operation of solenoid coils in the selector valve. A yieldable cross-pin mechanism in the lower end of the shift control shaft, as shown in Fig. 4, permits the shifting tube to be lifted by the hand lever to close the overdrive circuit contacts of the switch. The cross-pin is mounted in a plunger which slides in the hollow shift control shaft. The control shaft is slotted to receive the cross pin, and a coil spring is placed in the lower end of the shaft to keep the pin at the upper end of the slot during normal transmission shifting operations.

### Selector Switch

The selector switch, mounted on top of the lower end of the shift control shaft column as shown in Figs. 2 and 4, is provided with three terminals. Two of these are connected by wires to the solenoid coils in the selector valve—one being the direct drive contact and the other, the overdrive contact. The third terminal is connected to the battery in series with the interrupter switch, and is operated by the clutch pedal. Thus, in order to engage the overdrive, the in-

(Turn to page 64, please)

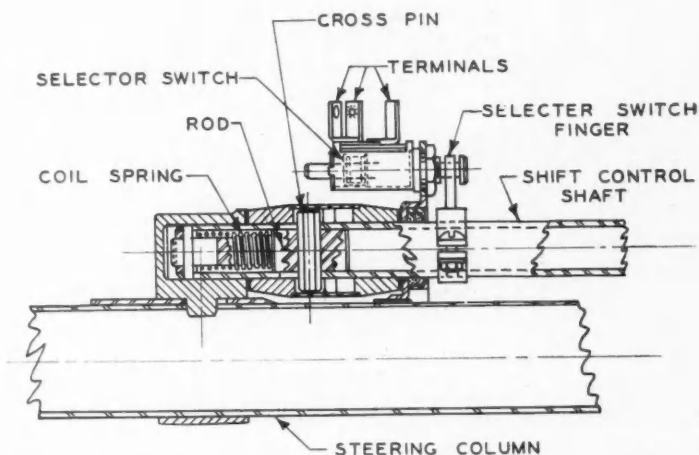


Fig. 4—Longitudinal sectional drawing of the Randal shift actuator and selector switch.

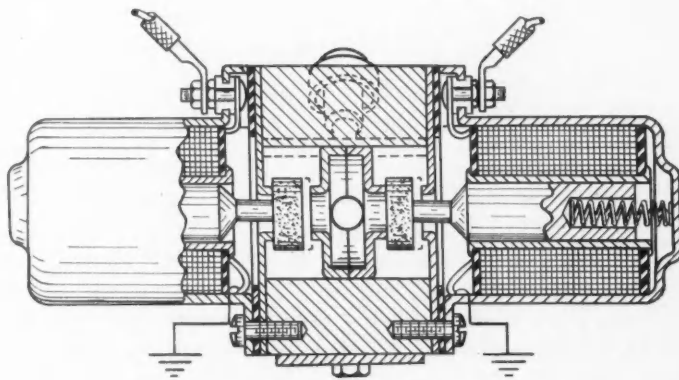
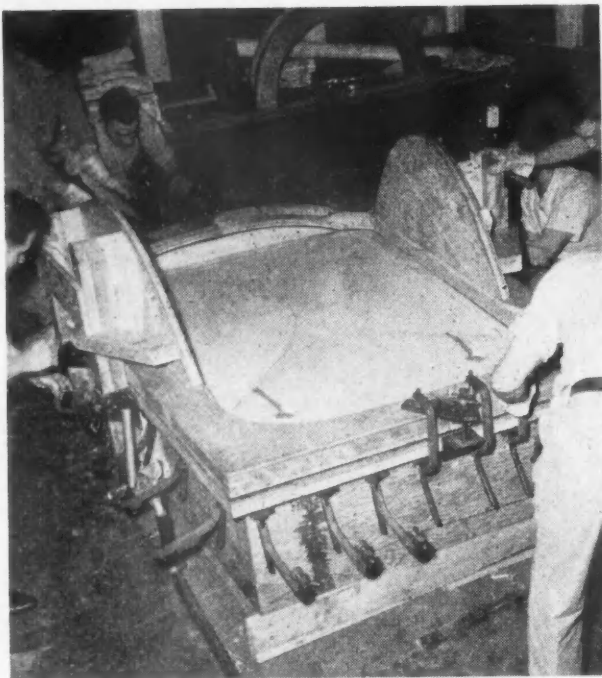


Fig. 5—Longitudinal sectional drawing of the selector valve of the Randal overdrive control.





The hot sheet of acrylic plastic (Plexiglas) is brought to the fixture from an oven by a monorail conveyor, and laid on the pneumatic forming apparatus. A plywood clamping frame is placed over its edges, and secured with quick-acting toggle clamps, as shown in this photo.



A wooden template is placed over the apparatus to check size and contour of the work, and warm air is slowly admitted under a pressure of about four or five psi. The door flaps inside the bubble are slowly opened as the bubble expands.

# Blowing Bubbles for Helicopters

By Kenneth Rose

**T**RANSSPARENT cabin enclosures for helicopters made by Bell Aircraft Corp. are required to be optically flawless. A nonshattering clear plastic (Plexiglas) is used for the structure, which takes the form of a bubble dome over the cockpit. This dome is in one piece, so that no corners nor opaque framing obscure vision at any point.

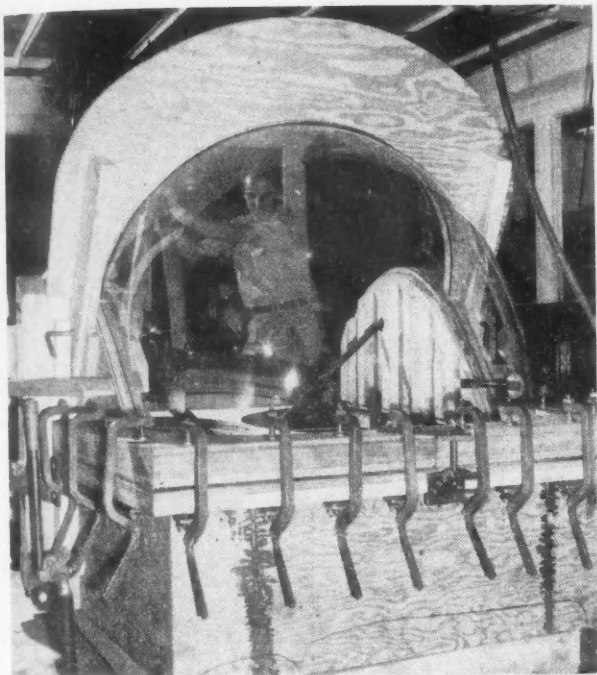
The most satisfactory method of producing this one-piece dome of plastic, uniformly curved and transparent for best optical qualities, has been to blow it as a huge bubble, without any restraining surface contacting the dome and marring its transparency. A somewhat similar method was used during the war for production of gun enclosures on fighting planes. The production of the helicopter cabin enclosures uses a fixture to hold the plastic sheet and channel the compressed air, a sealing ring of wood to clamp over the plastic and prevent escape of the air from between the sheet and the fixture, and a carefully regulated supply of compressed air, delivered inside the fixture through a low-pressure regulator controlled by an electronic "eye" that measures the growth of the plastic bubble.

The fixture is made of wood, as the temperature of the plastic as it is clamped in place is insufficient to cause charring. It is an air-tight box with numerous small holes spaced over its top to deliver the compressed air evenly under the plastic sheet. A com-

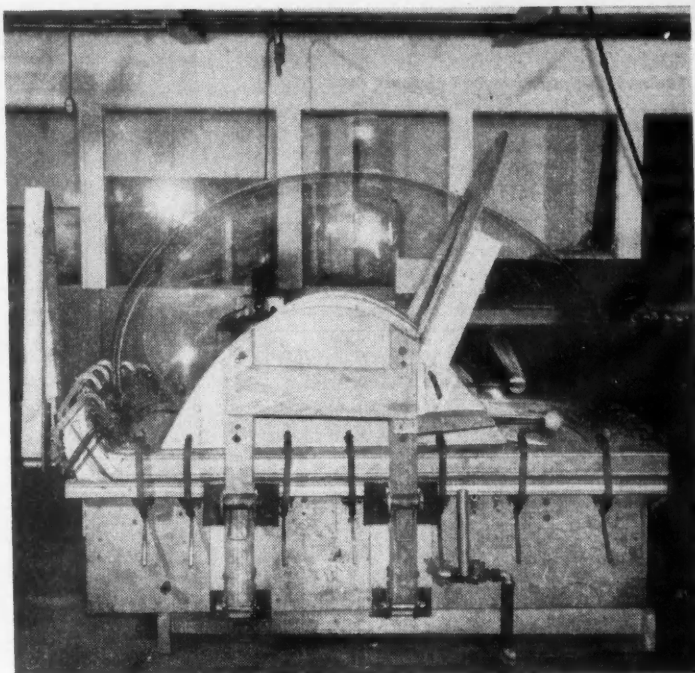
plication arises in making provision for the doors on each side of the cabin enclosure. Here the plastic dome is required to be flat, so that the doors may be fitted accurately. To provide for the proper areas of flatness at the door locations without distorting the contours of the remainder of the dome, paired flaps are used at each door location, one flap inside the fixture, its mate outside. Closing the flaps flattens the plastic at these points.

In forming the cabin enclosure, a rectangular sheet of plastic, 61 in. by 79 in., is heated in a furnace to 240-260 F, and is carried to the fixture on an overhead monorail conveyor. It is placed on the fixture, and the wooden ring, corresponding in size to the cockpit of the helicopter, is placed on the sheet. Quick-acting toggle clamps are used to hold the wooden sealing ring.

Compressed air is admitted slowly to the air-tight box in the fixture, and the hot plastic is gradually swelled into a bubble. The air pressure is limited to two-five psi so that the sheet will be formed slowly and evenly. The height is checked constantly during the forming stage, and a check is made to insure that the accuracy clearance for the rudder pedal is being maintained. A wooden template serves to check both size and contour. A photoelectric tube is used to regulate the air flow to the fixture, the tube being acti-



*When the bubble reaches full size, the door flaps are pressed firmly against the walls of the plastic form, flattening it at these points.*



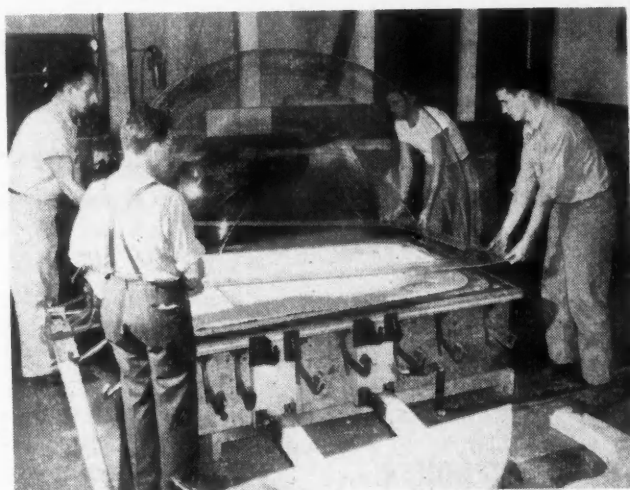
*Cool air is now forced into the bubble instead of heated air, and within about 15 min the plastic hardens.*

vated by a beam of light that indicates the growth of the bubble.

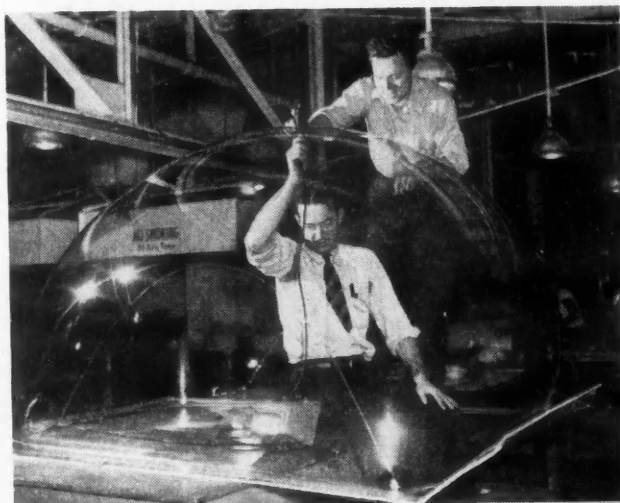
Before admitting air to the fixture, flat wooden pieces are placed at the door locations outside the plastic. As the bubble reaches its full size, mating flaps inside the fixture, hinged and actuated by lever arms, are raised to meet the outside flaps or door restrainers. Raising the inside flaps is done manually through a lever operated from outside the fixture. The curved plastic is squeezed between the flaps to plane surfaces of the correct size and location for the door openings. Its optical quality is of course lost by the contact with the flaps, but this is immaterial as the door areas are to be cut away.

The plastic bubble is permitted to cool for about 10 minutes, when it will have hardened and can be removed from the fixture. An inspection for minimum thickness is made with a General Electric magnetic thickness gage, using a steel block held outside the wall of the cabin enclosure at the point to be tested, while the pickup unit is operated inside. A certain amount of polishing is required to develop best optical clarity, and the door areas and the scrap portion around the edges are removed. The cabin enclosure is then ready for fitting to the helicopter fuselage. Use of the door flaps insures that each cabin dome will have standardized door openings, and the bubbles are therefore interchangeable.

The same process is used to form the plastic doors that fit over the areas cut out from the cabin dome. They are blown to a height of about three inches to give them a contour closely approximating that of the dome itself. The slight curvature also increases their rigidity.

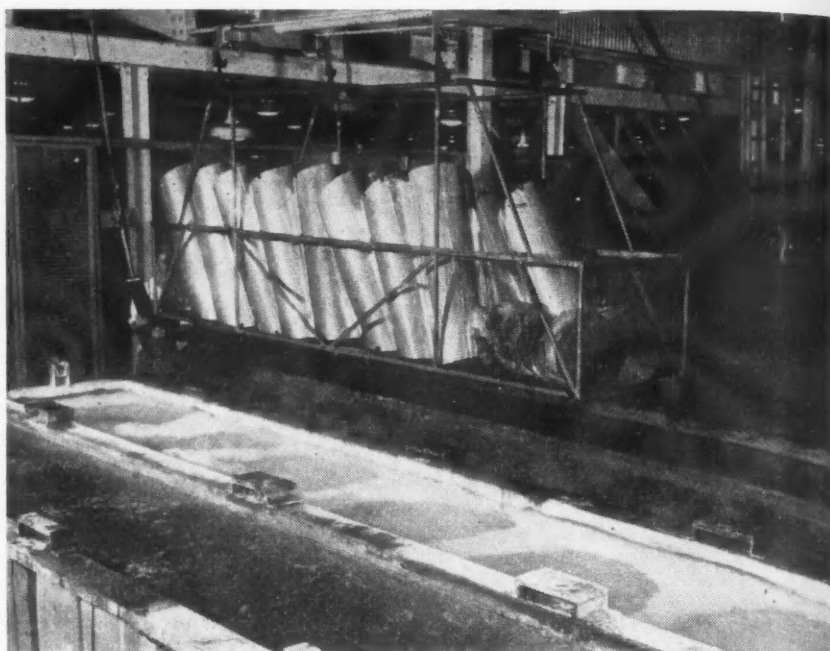
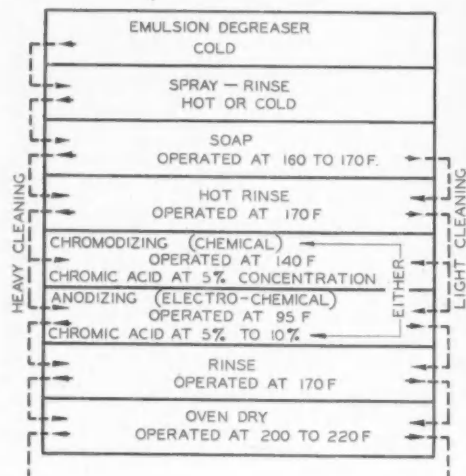


*Clamps are loosened, the clamping frame is removed, and the bubble is lifted from the forming apparatus. It weighs about 50 lb.*



*The bubble is checked for minimum thickness with a magnetic gage by holding a block of steel on the outside while the gaging unit is operated inside the enclosure.*

(Below) Suggested layout of tanks for processing aluminum products, using overhead conveyors. All tanks are of carbon-steel construction, and are gas or steam heated.



Alkaline wash tank and rinse at Douglas Aircraft Co.'s El Segundo, Calif., plant.

# Latest Methods for Cleaning Aluminum Prior to Painting

By S. H. Phillips,

Douglas Aircraft Co., Inc.

WIDESPREAD attempts to utilize aluminum in every industrial field have proved that this metal need no longer be confined to aircraft construction and the molding of pots and pans. Aluminum has opened unlimited production horizons with its durability, workability, lightness and ability to take and hold many types of fine finishing.

Extensive application of aluminum in the aircraft field during the war years is largely responsible for this wide interest. Those years of hurried production and rapid scientific development revolutionized all former opinions of handling and treating this metal. This is particularly true where subsequent painting and finishing processes are involved.

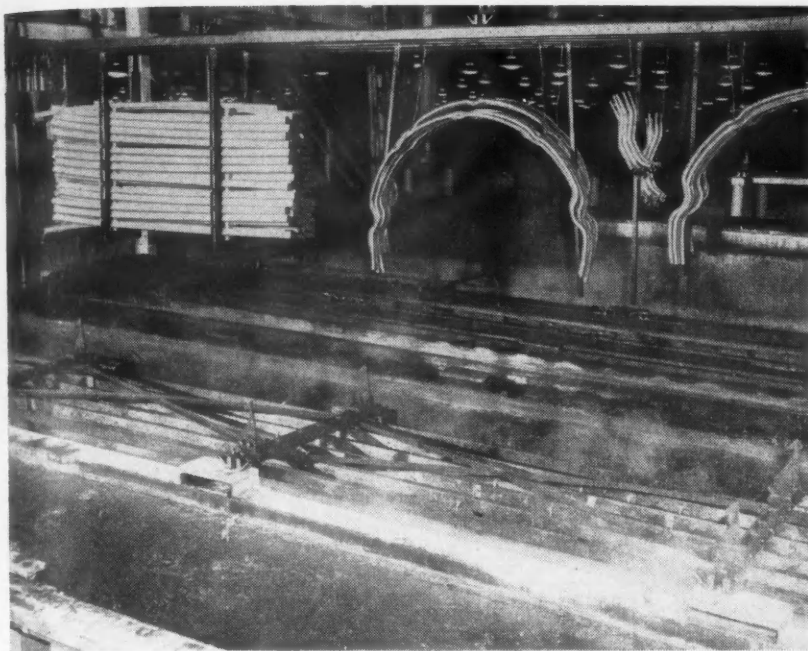
Aluminum is furnished in the form of castings, extrusions, forgings, sheet and tubing. Here it is treated under two general classes, cast and wrought aluminum. Castings may be die, permanent mold or sand-cast. The first type presents a smooth metal sur-

face; permanent mold has a surface of less smoothness; and a sand casting gives a rougher and, in most cases, a porous surface.

In order to produce a desirable finish over castings which present a rough exterior, sandblasting may be used, or a pre-treatment using a solvent-phosphoric acid etch followed by a chemical dip such as Alodine, which is also a chemical oxide coating, or Alrok or the electro-chemical process such as the Anodic treatment. Anyone of these treatments are frequently used as a base preparation on aluminum products, to improve the surface and paint adhesion.

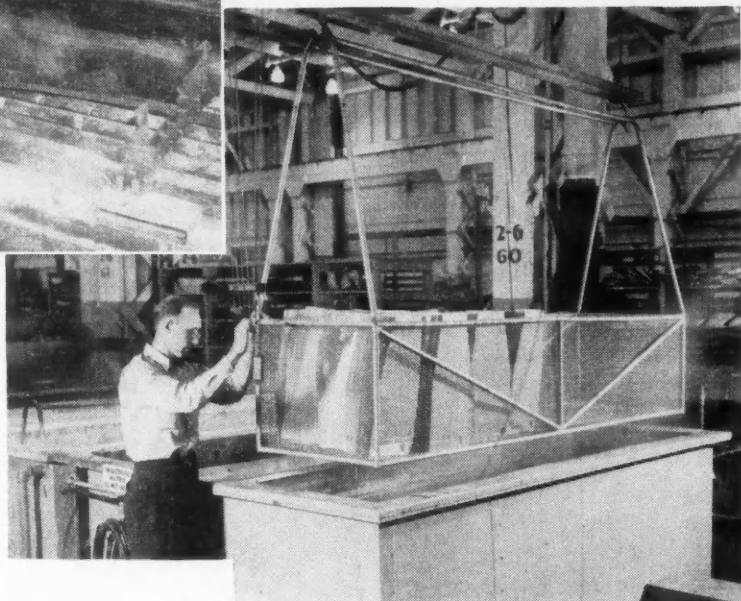
Aluminum is a reactive metal. Some alloys are extremely passive and need no protection. The high-strength alloys used for marine and military purposes are painted to protect against exposure. Their processing demands scientific treatment and care if successful paint adhesion or other finishing is to be realized. Sanding is insufficient for proper corrosion





(Left) View of processing tanks at Douglas plant. The Anodic tank is in the foreground.

(Below) Diversey etching process for cleaning aluminum parts prior to spot welding.



removal; adequate cleanliness and a "toothy" bond must be obtained before the paint will successfully adhere to the smooth, slick metal surface.

Most cases of paint failure are directly traceable to inadequate conditioning of the metal surface prior to the painting operation. If paint or other finishes are to adhere properly to aluminum and form a durable bond with the surface, the following conditions must prevail:

1. The aluminum surface must be free of grease, oil, drawing compounds and shop grime.
2. It must be free of corrosion products, oxide films, grit and metal particles (acquired during shop processing), corrosive salts, and welding or annealing scales.
3. It must be free of any chemical or material with an alkaline reaction.
4. It must be free of moisture.
5. It must present a somewhat "toothy" or porous surface.

Even though all these conditions prevail at the time of painting, paint adherence may later be destroyed if corrosion develops between the paint film and the metal surface. This frequently occurs in scratched or abraded areas when the surface of the aluminum has not been inhibited against corrosion before painting. Once corrosion sets in, it tends to spread, and large areas of paint may flake or peel off as a result. It is vitally important that the metal surface be passivated and made resistant to corrosion before the painting operations are begun.

### Aluminum Cleaners

Aluminum is one of the most difficult metals to clean. It is unusually porous and is rapidly attacked by alkalies, i.e., caustics, etc. Therefore, a solution

of any ordinary alkali should never be used on aluminum. Aluminum alloys containing silicon, copper or magnesium demand special cleaning materials, otherwise rapid corrosion attack will occur rendering the metal useless.

Absolute cleanliness of the Aluminum surface prior to painting and finishing may be achieved by one or a combination of six distinct methods. Each method provides advantages and disadvantages. Final choice of the cleaning procedure depends largely upon individual shop preference and the ultimate individual manufacturing purpose.

1. Solvent wipe-on cleaning is a hand process in which some volatile hydrocarbon material such as a solvent, kerosene or lacquer thinner is applied to the metal surface with cloths to remove oil, grease and contamination. However, this is a time-consuming operation, and should be avoided, if possible.

2. Vapor degreasing may be compared to an ordinary kitchen double-boiler. In this cleaning process the degreaser itself consists of a two-compartment machine charged with a non-inflammable chlorinated solvent cleaner. The solvent is heated and vaporized in the bottom compartment and the vapors rise to the upper compartment where they perform the cleaning operation, cool, condense and return to the lower tank.

(Turn to page 45, please)

# AIRBRIEFS



By ROBERT McLARREN

## Stock Taking

January is a time for resolutions and for plans and because it starts a clean slate it is also a time for stock taking—where are we; where are we going? And for these reasons it is AIR BRIEFS' custom to review the past year and examine the record of accomplishment. Technically, the past year was more productive than many of the fruitful wartime years for more new aircraft were flown, more records broken and more engineering developments were announced than in any single peacetime year in aviation's 44-year history.

## New Fighters

Both the Air Force and Naval Aviation proved during the year that jet propulsion had moved from an experimental engine stage into widespread aircraft production phase by bying a large variety of jet propelled fighters and bombers. In the Air Force, the North American XP-86 was flown with a swept wing, first tactical type to feature this unusual configuration. On the heels of its first test flight came a production order which will place this unusual new fighter into active combat service during this year. The Curtiss XP-87 was revealed as the most powerful fighter in the world and the first to be powered by four engines—believe it or not! The two-place craft features "all-weather" equipment permitting it to operate in the most extreme conditions of limited visibility. It is now at Muroc Air Base, Calif., with its first flight expected momentarily. The Navy XFJ-1, a stubby North American design, has also gone into limited production. Conventional in line, it features a "kneeling" gear which permits it to be parked and its engine run up aboard a carrier with its nose on the deck and its tail high in the air to exhaust its hot gases harmlessly above other airplanes and crew members.

## New Bombers

A veritable fleet of jet-propelled bombers flew during the year, mightiest of which was the Northrop YB-49 pow-

ered by eight jet engines with an output of 32,000 lb of thrust, greatest power ever placed in an airplane. The Flying Wing design, of which two have been built, offers the first opportunity to test both propeller-driven and jet propelled versions of the same airplane, the former being the XB-35 bomber powered by four 3000 hp engines. The Martin XB-48 and the Boeing XB-47 have six jet engines, a total of 24,000 lb of thrust each. Both types are unique in the use of a "bicycle" landing gear, in which both retractable main wheels are mounted tandem in the fuselage with tiny outrigger wheels for lateral stability while taxiing. The XB-47 is characterized by a 35 degree swept-back wing, which is designed to alleviate the difficulties of compressibility at high subsonic speeds. In the four-engined bomber category, the Convair XB-46 and the North American XB-45 made successful test flights, the latter emerging with a production order for 100 airplanes. The Navy created an unique craft with the Martin XP4M-1 which features two jet engines and two reciprocating engines mounted in tandem pairs in twin nacelles. In this long-range patrol plane, the jet engines will be reserved for takeoff and short bursts of power while the economical reciprocating engines will permit long range operations. Limited production orders have been placed for this odd new design.

## New Engines

The year saw further progress in jet engine development and the powerful Menasco XJ-37, rated at 5000 lb of thrust, was completed and bids accepted for its continued development and production. Outcome of this competition will be announced shortly. Allison revealed its new model 400 turbojet engine, most recent version of the J-33 type now rated at 4600 lb of thrust with continued power increases in immediate prospect. Most unusual new engine development of the year was the revelation that Pratt & Whitney Division of United Aircraft Corp. was undertaking the production of the British Rolls-Royce Nene turbojet engine of 5000 lb of thrust. This engine, used in the new

Grumman XF9F-2 Panther Navy fighter, is currently undergoing revision for American engineering and production and first P&W-made engine is expected for tests this spring with production slated for next fall. The new P&W Nene and the Allison will be alternate powerplants in the new Grumman fighter.

## Propellers Remain

Neither service saw fit to place all its eggs in the jet basket. First production models of the Boeing B-50 and the Canvair B-36 left the assembly line and joined the Air Force Strategic Air Command. Both types are powered by Pratt & Whitney R-4360 four-row radial engines. The Navy ordered more Grumman F8F Bearcat and Vought F4U Corsair fighters driven by propellers—just in case. Tactical thinking behind these "play safe" orders is the necessity for constant preparedness and with propeller driven airplanes on hand in quantity, both services are far more "ready to go" than would be the case with new unproved jet types.

## Commercial Liners

Two full-fledged postwar airliners are now being delivered, the Martin 2-0-2 and the Convairliner. Alike as two peas in a pod, the two craft were certificated by the Civil Aeronautics Administration for 20-ton gross weights powered by two 2100-hp Pratt & Whitney Double Wasp engines. In addition to large domestic orders, both types have been ordered heavily by foreign airlines, a tribute to U. S. aeronautical engineering and production skill.

## Status Quo

Technically, the aircraft manufacturing industry has mastered its two principal postwar problems—jet propulsion and the helicopter. They are now completely accepted aeronautical developments well past the experimental stage and into the quantity production stage. Still unsettled is the recurring question of the jet commercial airliner but current signs indicate at least a temporary shelving of this development for 1948 and possibly 1949 while the British press development of the type. The demise of the reciprocating engine is already well in view with no stronger signs needed than the growing conversion of the big reciprocating engine builders to gas turbine types. The broddingnagian Hughes Flying Boat proved that no limit exists on the size or the weight of a practical airplane, the Bell XS-1 no limit on its speed, and the Custer "channel wing" no limit on its slow-flying qualities. Only outerspace remains an unexplored new field for aircraft: and 1948 promises that experiment.

# OBSERVATIONS

By  
JOSEPH GESCHELIN

## Radiator Nomenclature

WE HAD A QUESTION RECENTLY AS TO the description of a new type radiator core and learned that nomenclature pertaining to radiator core design is one of the things not yet standardized. We understand that a group of radiator producers is going to do something about it. It looks like a natural for an SAE committee with authority to create standards and publish them.

## Where Are The Cars?

IT IS NOT ACCIDENTAL THAT A LEADING national weekly magazine had an article recently telling the public why everyone is waiting for a new car. Fortunately the author of the piece got his information straight from Detroit. Having some of the facts he was able to point out that the output of motor cars has been paced by steel shortages and other bottlenecks beyond the control of the manufacturer. He also notes

that the outlook is not much better for 1948. What is important, however, is that the public is getting the right dope.

## Greater Economy

NOTEWORTHY FEATURE OF THE 1948 line of Dodge trucks is the trick of using the same front end sheet metal panel and front fenders throughout the entire line of models from the lightest to the heaviest. On the light models the grille bars are finished in chromium; on heavier models the bars are painted. The front fender stamping is modified for the bigger models by piercing the opening to permit the addition of another fender panel to accommodate the wider trend. From the standpoint of styling this arrangement results in a pleasing family resemblance of all models; from the standpoint of production economy it marks a real accomplishment. Such interchangeability not only reduces the number of new press dies usually required but makes it possible to get high production press runs.

## Cleaning Aluminum

(Continued from page 43)

Vapor degreasing is an excellent method of cleaning for ordinary industrial purposes; however, it has several disadvantages in the technical processing of aircraft aluminum. This form of cleaning removes oil, grease and light contamination at intermediate stages of shop processing. It does not satisfactorily remove heavy grime, metal chips, oxide films or passivate the metal to provide the toothy bond prerequisite to good paint adhesion. Aircraft aluminum processing is largely concerned with the complete removal and elimination of these last mentioned soils.

3. Steam cleaning during aluminum processing employs an ordinary steam cleaning installation to combine heat, friction, steam and water with a mild alkaline cleaning detergent to remove unwanted soils from the metal surface.

4. Emulsion cleaning employs a chemical compound (mixed with petroleum solvents) which makes oil water-rinsable. The solvent activity of the solvent plus the ability of the emulsifying agent make both the contamination and cleaner water-rinsable in a

quick, thorough operation. Emulsion cleaners have the following advantages: they may be used cold, they clean quickly, and have the ability to remove light coatings of paint as well as identification ink markings. Emulsion cleaners must be considered only as pre-cleaners—cleaners which prepare the metal for final cleaning activity. They do not remove all dirt and soils, nor do they leave a water-break free surface.

5. Acid cleaning is used principally for the removal of oxide films during the processing of aircraft aluminum surfaces.

6. Hot tank alkaline cleaners are among the most valuable aircraft metal maintenance and processing materials. These cleaners are composed of combinations of various alkalies with recognized water softeners, surface tension reducing agents, rinsing agents and suitable corrosion inhibitors. Alkaline cleaners should be used by the hot tank immersion method and parts cleaned should be after-rinsed in clean, hot water.

When properly formulated — and properly used—hot tank alkaline cleaners remove all dirt, grease, oil and contamination leaving a water-break free surface which contains no residues and is chemically clean. There are two principal types of alkaline cleaners: noncorrosive materials which contain

## Suggest Florigel

SOME TIME AGO WE COMMENTED ON THE problem of industrial waste disposal, particularly an economical means of getting rid of spent soluble oil mixtures. One reader suggests the possibility that a solid emulsifying agent such as Florigel, a proprietary colloidal clay, might be employed for the purpose and removed by simple filtration. We offer this for what it may be worth. What do you think of it? If anyone is interested, we shall be glad to put him in touch with the maker of Florigel.

## Industrial Dermatitis

THAT INDUSTRIAL DERMATITIS, PARTICULARLY that attributed to cutting fluids, can be controlled by proper hygienic methods stands out prominently in a confidential report based upon study and analysis of the literature for the past century. The brightest light is shed by a report issued by the Guide Lamp Div., General Motors Corp., dealing with its war record. Using a combination of known hygienic techniques, under the supervision of its medical department, Guide Lamp chalked up an amazing performance—complete freedom from cases of dermatitis for a period of 18-million man-hours of operation.

inhibitors (generally silicates) intended to prevent the compound from etching the aluminum surfaces (a factor which somewhat reduces the full rinsibility of the product); and corrosive alkaline materials containing caustic soda without inhibitors. These corrosive materials are used when the removal of dirt, grease, oil and oxide films plus etching of the metal surface is desired in one complete operation. An acid bright dip must be used following immersion in corrosive alkaline detergents to remove the dark smut which forms on the metal itself.

## General Cleaning

Regular aluminum alloy parts coming from shop fabrication or heat treatment are immersed in a mild alkaline hot tank solution (Diversey DC-1). The hot tank is maintained at a temperature of 160 F at a concentration of six oz of DC-1 per gal of water. Parts are removed from the hot tank and rinsed in a cold water spray tank. They are then cleaned in a second hot alkaline tank followed by rinsing in hot running water maintained at 170 F. After this second rinse, parts proceed to either anodizing or chromodizing. (At El Segundo the anodizing and chromodizing tanks are adjacent in

(Turn to page 54, please)



# NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 58

## J-14—Heavy Duty Radiators

The Young Radiator Co. of Racine, Wis., announces a new type radiator known as the "Mono-Weld" for heavy-duty gasoline, gas and Diesel engine applications.

Using the latest electric welding methods, the Mono-Weld is an outgrowth of a wartime demand by the Navy for a heavy radiator tank which would stand the shock of gun recoil. Young engineers pioneered the welded-steel tank, to meet the Navy's rigid requirements.

The new Mono-Weld line covers a complete range of sizes from the smaller units, approximately 2½ ft. square, in graduated sizes up to the larger

units, approximately 10½ ft. square.

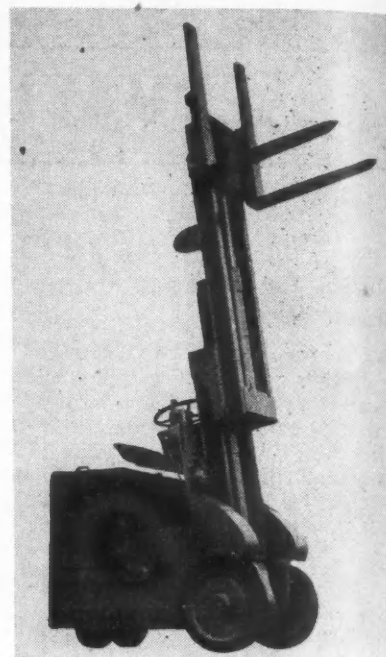
Innovations of this line as exemplified by one of the larger radiators, approximately 7 ft. wide and 9 ft. high, has fabricated steel headers, formed steel side members and seamless tubes brazed to heavy header plates. This Young Mono-Weld radiator has 24 cooling sections, any of which can be removed for repair or replacement in a matter of minutes. Important to the operation of this type unit is the special, aerodynamically-designed fan with variable pitch, which can be adjusted for temperature and climatic changes. Either a pusher or puller fan can be used, sucking the air in or blowing it out of the core, as the particular installation may require. Heavy steel formed and welded shutters are used to insure better control of the cooling process.

The entire unit is mounted on steel feet, welded to the side members, which in turn are fitted with steps so that an operator can get at the top of the radiator for inspection and filling.

## J-15—Compact Fork Truck

A new fork truck engineered for crowded operating conditions, both vertical and horizontal, thus enabling palletized handling in operations where it has never before been possible, is now in production at Automatic Transportation Co., 149 W. 87 St., Chicago 20.

With dimensions designed especially



Skylift Shipper

for motor truck and trailer bodies, congested warehouses and other conditions such as crowded aisles, narrow loading docks and low doors—all of which have prevented the use of fork trucks in many shipping operations—the new unit is known as the Skylift Shipper.

The Shipper is said to be the shortest fork truck ever made capable of handling 2000-lb up-to-48-in. loads, enabling it to work effectively on docks and in storage areas too crowded or small for ordinary fork trucks. Its low collapsed height of 68 in. permits easy entry into motor trucks, sub-standard factory or warehouse doors and other low-clearance portals.

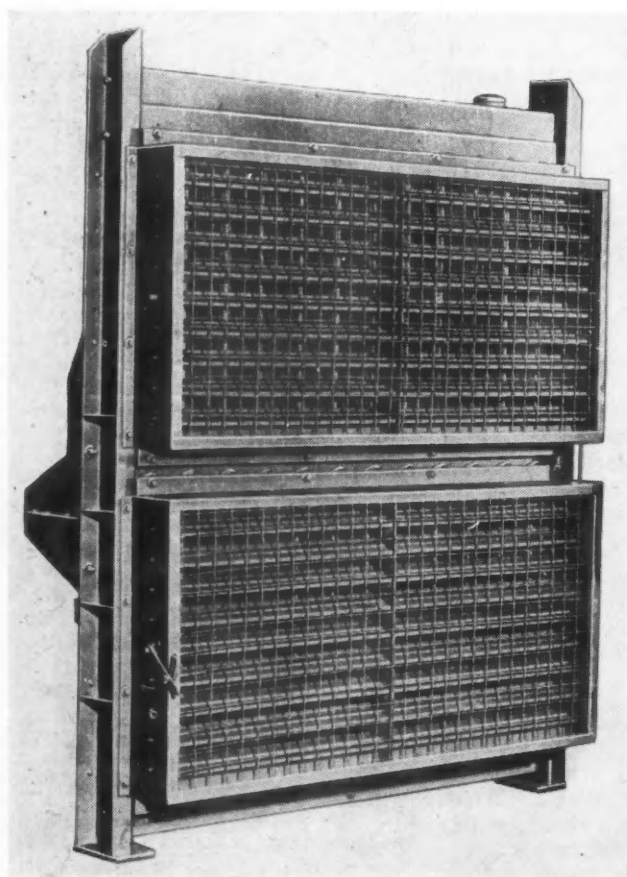
Tiering to ceiling heights in refrigerator cars and motor trucks, as well as easy entrance, is also possible with the Skylift Shipper, because its telescopic lift is designed so that the forks and uprights are raised independently by separate rams. Hence, the Shipper's forks raise to 58 in. before the uprights begin to extend. Maximum lift of the Shipper is 108 in.

The Shipper also incorporates the Newmatic controller, which acts as the electric counterpart of automotive automatic gearshift; silicone insulation and lubrication of the electrical system, and full automotive-type operator controls.

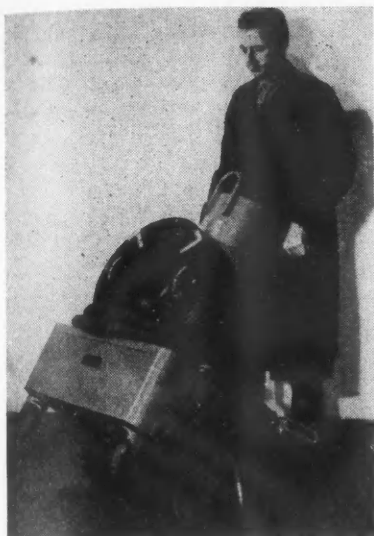
## J-16—Portable Unionmelt Welder

The "Unionmelt" welding process (submerged melt welding) can now be made easily available anywhere in the shop, on any work that can be suitably positioned. This is accomplished with the new "Unionmelt" flexible welder, manufactured by the Linde Air Products Co., Unit of Union Carbide and Carbon Corp., New York, N. Y.

The machine is said to be particularly



Young Mono-Weld type radiator



Unionmelt flexible welder

useful for making welds that are inaccessible for fully automatic welding, making short welds where it is not worth while to mechanize the operation, building up deposits of almost any size or shape, and depositing metal to repair weld or casting defects. The "Unionmelt" automatic flexible welder can be used as a primary welding tool in a small welding shop or as a supplementary tool for fully mechanized installations.

The special feature of this machine is that the welding nozzle, at the end of a 20 ft long flexible hose, when held in the operator's hands, can be moved from one weld to another without stopping to set up track, carriage or other guiding equipment.

The flexible hose, connecting the nozzle to the main machine assembly, contains the welding current cable, and two tubes through which the welding rod and the granular material are fed. Bare welding rod of any size up to 5/32 in. diameter in the standard 25-lb coils can be used in the machine.

Granular welding composition is continuously supplied to the welding nozzle by compressed air from a storage tank included on the main machine assembly. This tank, holding about 75 lb of the material, provides an adequate supply so that an entire 25 lb coil of welding rod can be fed without interruption and without danger of flash which might occur frequently if a smaller supply were used. The granular material flows by gravity from the welding nozzle and the operator controls the depth of the layer laid down by the height at which he holds the nozzle above the work surface. Included in the main machine assembly, in addition to the tank holding the supply of granular material, are a specially-adapted standard "Unionmelt" welding head, the control unit, and a rod reel. This assembly, compactly arranged, is mounted on wheels and can be moved anywhere in the shop. All controls are operated from a small portable switch box which

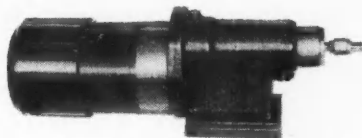
the operator can keep with him within easy reach.

The flexible welder has a capacity of 900 amp, either direct or alternating current, which may be supplied from any welding generator or transformer. Compressed air at about 35 psi pressure is required to force the granulated composition through the flexible tube to the nozzle.

## J-17—High Speed Drilling Units

The Govro-Nelson Co., 1931 Antoinette St., Detroit 8, Mich., is now offering new high speed drilling units—the Model "J-6" with 6000 rpm and the Model "J-9" with 9000 rpm spindle speeds.

Both models are equipped with three phase, 60 cycle induction motors geared up to the spindle speed specified for



Govro-Nelson drilling unit

each model. With an adjustable stroke up to 3/4 in. and maximum collet capacity of 1/4 in., the units are suitable for drilling, reaming, countersinking, spotfacing and hollow milling.

The design features ball bearing suspension and free rolling centrifugal weights. The feeding mechanism operates in an oil bath with the unit sealed to retain the oil and prevent entry of coolant. A built-in rate of feed control provides the slow feed required for reaming or faster feeds for other operations. The spindle dwells automatically at the forward end of the stroke to clean up on a countersinking or spotfacing operation.

Both models are completely self contained and may be operated at any angle in single or multiple set-ups, simultaneously or in sequence with remote electrical controls.

## J-18—Press-Type Welding Machines

A new series of press-type welders has been added to the line of Sciaky Bros., Chicago, Ill. Utilizing a standard frame size, these welders offer a choice of five power ratings—20, 30, 40, 50 and 75 kva—and four throat depths—12, 18, 24 and 30 in. Capacities on mild steel range from 0.016 in. up to 0.125 in.

If desired, the welders can be furnished with "Three-Phase." According to the manufacturer, this feature reduces the required power rating by 50 per cent and operates on a balanced three phase load at a power factor of 85 per cent or better. The "Three-

**NEW**

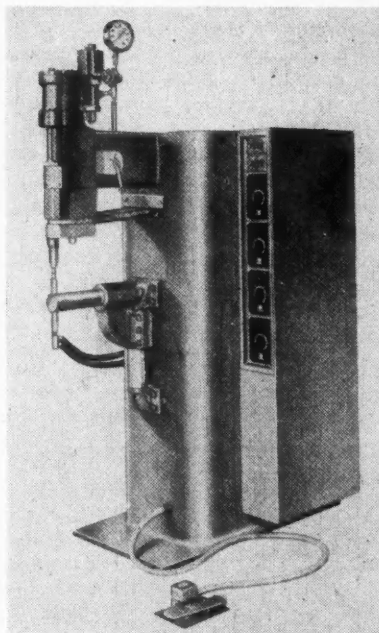
**Production  
and Plant**

**EQUIPMENT**

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Phase" control permits the welding of aluminum, brass, etc., with nominal power supply.

Standard features of the machines include: fully automatic electronic control of the welding sequence; frame of 3/4 in. steel plate, designed and ribbed to maintain alignment and reduce deflection; special cast and precision machined head with tapered bushings to compensate for wear. The welders are entirely self-contained. Controls are



Sciaky spot welder

mounted in a hinged side cabinet with dials convenient to operator.

Optional features include a pre-heat and post-heat sequence which permits the welding of scaly and high carbon steel. Welders up to 24 in. throat depth can be furnished with T-slotted patterns for projection welding.

## J-19—Testing Machine

A Brinell testing machine capable of checking up to 800 pieces per hour and checking parts varying in diameter and thickness as much as 3/4 in., without moving the elevating screw, is the latest product of Steel City Testing Machines,

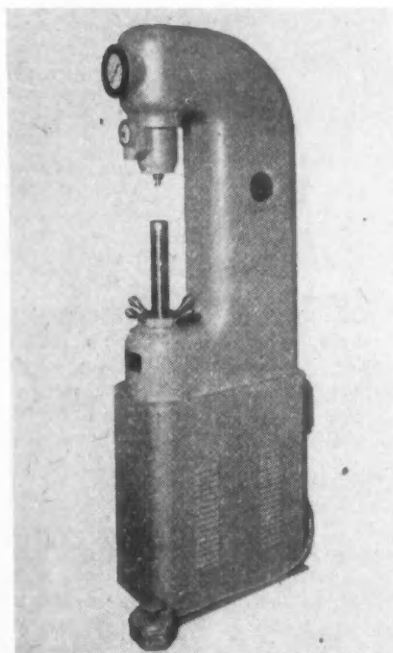
# NEW Production and Plant EQUIPMENT

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Inc., 8843 Livernois, Detroit 4, Mich. It is identified as model KDR.

This machine is motor driven, hydraulically operated and so constructed that it is impossible for the operator to remove the specimen being tested before the full load has been applied to the penetrator. The load is held for a predetermined time cycle—adjustable from 2 to 15 seconds duration—after which time the penetrator automatically reverses itself to starting position, ready for the next test. Specimens or parts which are alike in thickness or diameter within  $\frac{1}{4}$  in. are tested without moving the elevating screw.

This machine is equipped with a comparator indicator which eliminates the necessity of using the Brinell microscope on production testing. It can be furnished with a foot or knee type starter switch. Throat opening is six in., and maximum vertical opening is 14 in. Standard equipment includes flat and vee type anvils.

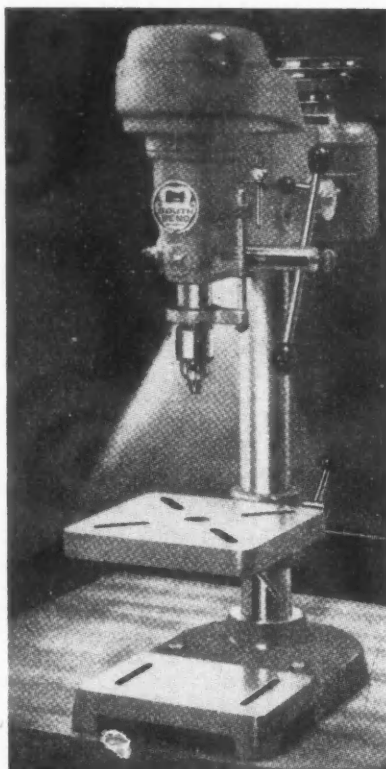


Model KDR Steel City Brinell testing machine

## J-20—Precision Drill Press

A new 14-in. precision drill press is now in production at the South Bend Lathe Works, 119 E. Madison St., South Bend 22, Ind. It is available in both bench and floor models.

The spindle has a maximum travel of four in., with spindle speeds of 707, 1305, 2345 and 4322 rpm. The free-floating spindle design is said to prevent misalignment, side thrust and whip.



South Bend drill press

The depth gage is graduated in sixteenths of an inch, and has adjustable collars to control both the depth of feed and the length of the return stroke. Two precision ball bearings carry the drive unit load and two additional ball bearings carry the spindle, which is spline driven. All ball bearings are pre-lubricated and sealed. The spindle quill bearing has adjustment to compensate for quill wear. Drilling capacity is  $\frac{1}{2}$  in. in iron or steel at the center of a 14-in circle.

A full tilt type table, with 10 in. by 10 in. with a precision ground top surface, has slots for clamping fixtures or work. An improved type of double plug binder is provided for locking the table in any position on the 2 $\frac{3}{4}$ -in. diameter column.

The bench model drill press has 10 $\frac{1}{2}$  in. maximum chuck to table distance, 10 $\frac{1}{8}$  in. table travel, 17 in. maximum chuck to base distance, 10 $\frac{3}{4}$  in. by 17 $\frac{1}{4}$  in. slotted base with precision ground top surface, 35 $\frac{1}{2}$  in. over-all height, 195 lb domestic shipping weight.

The floor model drill press has 40 $\frac{1}{2}$

in. maximum chuck to table distance, 40 $\frac{1}{8}$  in. table travel, 46 $\frac{1}{2}$  in. maximum chuck to base distance, 15 in. by 21 in. slotted base with precision ground top surface, 65 $\frac{1}{2}$  in. over-all height, 235 lb domestic shipping weight.

## J-21—Tapping Head

The Commander Manufacturing Co., 4225 W. Kinzie St., Chicago, offers a tapping head which will handle taps from No. 0 to  $\frac{3}{4}$  in. The new tapper is designed to fit any drill press.

The Commander tapper employs a spring clutch drive and an adjustable torque control. This spring clutch drive is said to eliminate the slippage and wear caused by misadjustment and misuse. In addition, it is impervious to oil, grease, moisture, weather, etc. Torque can be set when the tapper is on or off the drill press, by pushing a button and turning the scale to the desired position for the tap to be used.

All operating parts are heat treated alloy steel, precision ground. Heavy duty bearings are used throughout. Design of the tapper housing assures maximum visibility of the tapping operation.

## J-22—Power Lift Truck

Now coming off the assembly line at the North Bergen, N. J., plant of Revolver Co. is a new walk-along power lift truck which has been christened the Go-Getter. It is self-contained but with adjustments within easy access, and is claimed to be amazingly powerful for its diminutive size—27 $\frac{1}{2}$  in. between control handle and back of battery box.

The Go-Getter has a single package hydraulic lift unit on which all adjustments can be made from the outside. To simplify maintenance or repairs, the



Go-Getter power lift truck

hydraulic or power unit can be quickly and easily removed from the body.

The platform truck comes in 4000 and 6000 lb capacities. Heights 7, 9, or 11 in. Lengths 36, 48, 54, 60, 72 in. and over with 26 $\frac{1}{2}$  in. width. The platform will raise a full 4 in. Six-in. height is available under certain conditions.

The Go-Getter operates on a six-cell 13-plate battery which gives normal eight-hour operation.

Front wheels are 12 x 3 $\frac{1}{2}$  in. dual wheels with demountable rubber tires.



## K-11—New Model Chronolog

The new Model X Chronolog, a product of the National Acme Co., Cleveland 8, Ohio, records, at preselected intervals, when, for what cause and how long a machine is idle. Its tabulated production record also indicates the number of



Model X Chronolog

units produced (feet or pieces) and the productive time required.

Most of the data produced by the Chronolog are subject to graph and percentage presentation. These records can be compared to previous periods and estimates.

Chronolog, Inc., Detroit, Mich., is the distributor for the new Model X Chronolog.

## K-12—Improved Wound Rotor Motors

A line of improved totally-enclosed, fan-cooled, wound-rotor motors has been brought out by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. The motors are built with an improved tube-type air-to-air heat exchanger, first used for squirrel cage motors. The greater efficiency of this exchanger is claimed to permit a reduction in size.

The improved motors can be readily adapted to suit the requirements of any special industry.

To assure trouble-free operation under extremely unfavorable atmospheric conditions, the motors can be built with stainless steel ventilating tubes, fans, and end plates and cast iron terminal boxes and collector ring enclosures.

## K-13—Bearing Clearance Checking Device

Checking main and connecting rod bearing clearances is said to be easy when Plastigage, a new product of the Perfect Circle Corp., Hagerstown, Ind., is used. A piece of Plastigage is placed on the bearing shell. The bearing cap is retightened on the crankshaft. The bearing cap is removed. The width—

not the thickness—of the flattened Plastigage is measured with the scale on the Plastigage envelope. The reading is directly in thousandths of an inch.

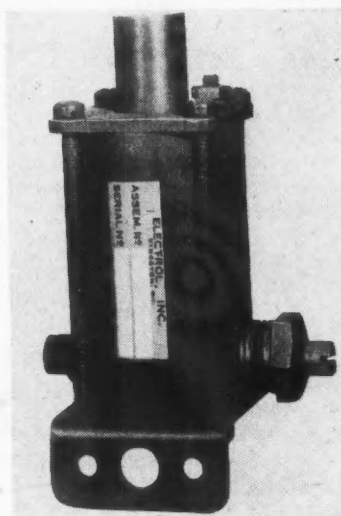
This product is available in two sizes: for measuring clearances of two to six thousandths; and for measuring clearances of four to nine thousandths.

## K-14—Control for Hydraulic Brakes

A new brake control, called RolControl, which prevents cars from rolling forward or backward when halted on grades and which prevents "creeping" on the level has been brought out by Electrol Incorporated of Kingston, N. Y.

The RolControl is an electromagnetically operated device which fits into the car's brake system immediately after the master cylinder. When energized, it holds brake pressure until released by a fingertip slide located on the shift lever. The RolControl weighs less than 2 lb.

The wiring circuit passes through the ignition switch so that the RolControl



The RolControl

cannot be left on unintentionally when the car is parked. The dashlight indicator shows red when the unit is energized. Current consumption is about equal to that of a stoplight.

The RolControl has been designed so that six models of the one basic unit cover all model cars.

## K-15—Spark Plug with Built-in Resistor

The Electric Auto-Lite Co., Toledo, Ohio, has announced a new spark plug with a built-in resistor which suppresses spark plug interference with radio, radio-telephone, radar and television reception. The company stated that the new resistor spark plug will provide smoother operation and improved economy.

The new Auto-Lite plug features a

**NEW**



**PRODUCTS**

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built-in 10,000 ohm resistor which reduces electrode erosion, thus allowing for a wider gap setting.

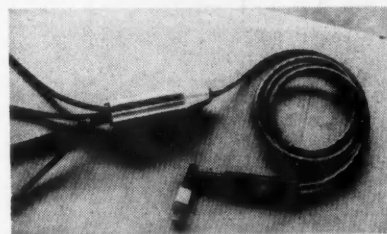
Other benefits claimed by the company for the new Auto-Lite resistor spark plug include smoother idling as the wider gap helps to eliminate occasional missing; reduction of ring and cylinder wear when lubrication is washed away by gasoline not burned as a result of occasional misses; reduction of misfiring due to lean spots in carburetion; better burning of leaner mixtures bringing about improved engine economy at idle and throughout the speed range; and increased electrode life.

The new spark plug will soon be available for original equipment and for replacement on many popular makes of cars, trucks, and tractors.

## K-16—Manual Heliweld Holder

A new, water-cooled manual Heliweld holder has been placed on the market by the Air Reduction Sales Co., New York, N. Y.

This holder, designed for continuous production work with the inert-gas-shielded arc welding method, features water cooling, an all-plastic insulated exterior, a gas cap made of non-con-



Water-cooled manual Heliweld holder

ducting material and a light, flexible cable encased in a durable, translucent plastic cover. The holder cable is sufficiently long to permit freedom of movement and rugged enough to withstand hard usage.

The new Airco manual Heliweld holder has a current capacity of 300

# NEW ★ PRODUCTS

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amp a-c or d-c and is fully insulated for the high-frequency current which is often required for arc-starting and stabilization in welding.

According to the manufacturer, cooling of the holder is highly efficient and extends almost to the point at which the electrode is gripped. The new manual holder is approximately 10 in. long, weighs about 28 oz. and handles tungsten or carbon electrodes up to 3/16 in. diameters.

## K-17—Vertical Gearmotor

A new vertical Gearmotor is the latest addition to the gear drive line of the Westinghouse Electric Corp., Pittsburgh 30, Pa. Each unit is a self-contained drive, consisting of a high speed motor and speed reducing unit. Nine different gear ratio combinations are available, ranging from 7.61:1 to 38.9:1.

These self-contained vertical Gearmotors are available in 3 to 50 hp, 220, 440 or 550 volt, 3-phase, a-c, and 3 to 7½ hp, 115 or 230 volt, d-c. They may be equipped with practically any standard motor in a variety of enclosure types including open protected, semi or totally enclosed and explosion proof.

Special features claimed for this new vertical Gearmotor are: The design of

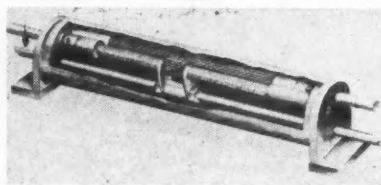


Westinghouse Gearmotor

the gear case is such that all gears and bearings receive positive lubrication at all operating speeds; quiet operating, single helical gears and pinions of 40 to 50 carbon steel are given the Westinghouse BPT "tough-hard" heat treatment before hobbing; maximum strength and tooth overlap; uniform loading—slow uniform wear; and lower impact stresses from sudden shocks or reversals.

## K-18—New Type of Synchronizer

Taber Associates, 401 N. Broad St., Philadelphia 8, Pa., have designed a device to provide synchronization between two sources of power. However, by the addition of extra pinions any number up to six engines, or power sources, can be synchronized together.



Taber synchronizer

It is completely enclosed and operates in an oil bath. It may be overridden by manual control at any time. Clutches are provided so that in the event of complete stoppage of one power source, no damage can occur. Its outer dimensions are extremely compact, total length 10½ in., total width 2¼ in., height 2¼ in., approximate weight 3 lb.

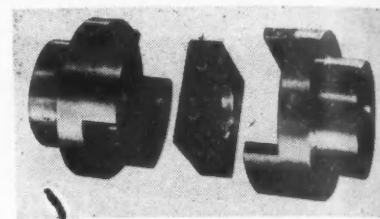
The principle of operation is that of a lengthwise main pinion, which is attached to the main power source. Another shaft contains a short pinion which rides on a screw thread. If the two power sources are operating at identical speeds the lengthwise pinion operates the small pinion at the same speed, in which event there is no movement lengthwise of the small pinion riding upon its screw thread. In the event that one power source slows down, the small pinion moves lengthwise, opening the throttle or speed-control of the slower power source, and slowing down that of the faster power source until such time as exact synchronization has been reached. The application of the above control to industrial power sources is not limited to internal combustion engines, but can be used equally well to pull into synchronism two electric motors, according to the manufacturer.

## K-19—Improved Coupling

The American Flexible Coupling Co., Erie, Pa., has recently increased the wearability of its flexible coupling by an improvement in the design. The purpose of the American coupling is to permit shafts to operate misaligned without transmitting reactionary stress-

es which might increase the bearing temperature and accelerate the rate of bearing wear in the prime mover or driven machine.

The only part that absorbs wear in these couplings is the center member



American coupling, disassembled

or block which has a free sliding action between the two jaw flanges of the coupling. This center member is faced with bearing strips which are the points of contact with the jaw flanges. The center block was recently improved so that the bearing strips now slide upon the center block to which they are secured. This reduces the friction which results between the bearing strips and the flanges as the coupling rotates.

## K-20—Tires with New Non-Skid Tread

The Firestone Tire and Rubber Co., Akron, Ohio, has developed a new tire tread which is said to grip ice and wet pavements with great effectiveness. Secret of its extra safety and traction is the Icoel construction of the tread. Thousands of small Icoel particles are molded into the rubber by Firestone; as these particles are exposed by tire wear, they fall out, leaving thousands of tiny suction cups in the tire tread to assure non-skid protection.

Two designs will be available—the DeLuxe Champion, for city and suburban driving, and the Studded Ground Grip, for operation on unimproved roads.

## K-21—Hydraulic Truck Seat



This Bostrom Model 47 hydraulic suspension seat, a product of the Bostrom Manufacturing Co., Milwaukee, Wis., is equipped with a shock absorber valved for the individual driver. It has a rubber cushion and easily-replaceable, snap-on covers. One or more of the six main springs may be removed to provide ride control.

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## K-22—Fuel Controls for Jet Engines

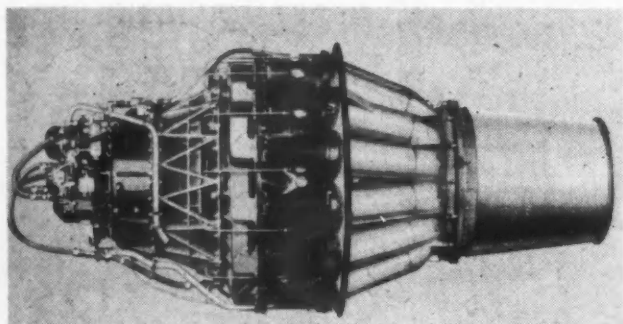
New standards of turbojet and turbo-prop engine fuel control efficiency, with longer engine life, are claimed for the new Bendix "Speed-Density" control and starting system for gas turbine jet engines, according to an announcement by Bendix Products division, Bendix Aviation Corp., South Bend, Ind.

The Bendix fuel control is of the all-speed governor type, in which the fuel feed is predetermined according to the engine speed and entering air density; hence the name "Speed-Density." All fuel control is grouped in one unit which contains a governor, barometric corrector, a throttle valve, shut-off valve and pressure relief valve. The principle of operation is such that the metering is not disturbed by the change of nozzle pressure, nor by the change of fuel supply pressure—so long as the latter is adequate for maximum power.

Diaphragm pressure metering is utilized. This speeds up the response of fuel feed to throttle movement.

No "compensating droop" is required, and considerable variation in fuel density can be handled without governor readjustment.

Since maximum and minimum fuel feeds are predetermined, rich "hot" charges are avoided during accelerations, and both high power blow-outs and idle die-outs are said to be eliminated. The tendency for "compressor stall" with axial compressors is reduced and engine life is prolonged, while the



Typical installation of Bendix speed-density fuel control on turbo-jet engine.

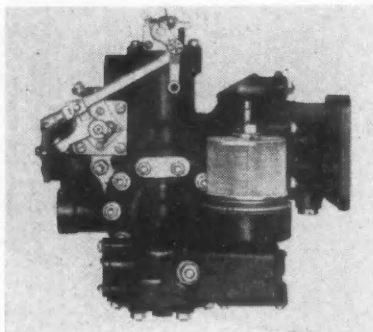
pilot is given an unlimited freedom of throttle manipulation.

According to Bendix, the pilot need only to move the throttle lever and the engine is automatically controlled within the operating limits regardless of the rate of throttle opening or closing and at any altitude within the range of the aircraft.

Differing from previous practices in which fuel is fed to all the engine burners during the engine cranking period, with an extremely hot, explosive effect when ignited, the new Bendix Starting System utilizes only two burners having spark plugs, and on ignition, these operate alone until a predetermined pressure or temperature is attained. Fuel is fed and the flame travels to the other burners progressively. The engine reaches the full power running condition smoothly and remains comparatively cool.

The Bendix Starting systems vary in detailed application according to the particular engine design, but function in general as follows:

The fuel flow is cut off by a solenoid valve during first cranking. When a certain speed is reached, high fuel pres-



Bendix speed-density fuel control unit

sure is released on the starting nozzles only. Simultaneously the ignition spark is turned on.

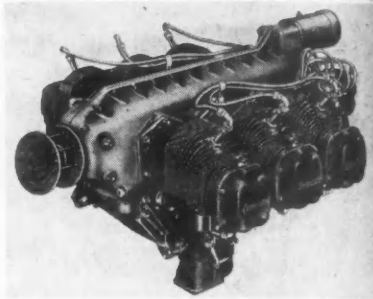
At first the fuel flow is confined to the two flame tubes which have spark plugs, and in these ignition takes place immediately. The starting flow may be diverted to special torch units, which combine starting spray nozzle and spark plug.

At a predetermined pressure or temperature signal, the fuel flow is momentarily turned on full into the main nozzle ring, after which normal meter-

ing is set up. The various flame tubes catch fire in turn and the entire engine begins to fire quietly and smoothly. Ignition is then automatically cut off. (As is the fuel flow through the starting nozzle if a starting torch is used.)

## K-23—Continental Engine Approved by CAA

Continental Motors' new C-145 aircraft engine has passed its Civil Aeronautics Administration tests and has been issued type certificate number T-253. It is a six-cylinder engine rated



Continental C-145 engine

at 145 hp at 2700 rpm and is the ninth model in Continental's line of horizontally-opposed aircraft engines.

Two airplane manufacturers plan to use the C-145 in new four-place models scheduled for early public showing, according to officials of Continental Motors Corp.

## K-24—Fire-Resistant Panel Material

The Skydyne Corp., Port Jervis, N. Y., has developed a fire-resistant paneling that is said to protect human flesh within one inch of fire at 2,200 F. Expected to reduce aviation fire hazards and to have other uses, the new panels are made of specially treated Du Pont "Strux" cellular cellulose acetate plastic sandwiched between sheets of extremely thin (0.006 in.) carbon steel. Test panels are ¼ in. thick. They weigh less than a pound per sq ft.

Civil Aeronautics Authority specifications for airplane firewalls require material to withstand applied heat of 2,000 F for a period of 15 min. In official tests, the new steel and plastic paneling withstood applied heat in excess of 2,200 F for more than 30 min.

At the end of the test period, the hand could still be held comfortably less than an inch from the panel on the side opposite from the fire, according to the manufacturer.

The plastic core material, cellulose acetate, is not fire-resistant, being classified as slow-burning. In this application, however, as a result of special treatment by the developers of the paneling, the plastic, on exposure to heat, forms parchment-like layers. These layers act as a heat barrier. The panels also insulate against noise.

# In the Spotlight...

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# Buick's New Dynaflo

(Continued from page 31)

is composed of two major elements: the torque converter and the hydraulically-controlled planetary gear box. The torque converter, shown in Fig. 2, has five individual rotating parts: the primary pump driven from its rim and directly connected to the flywheel, the turbine which is driven from the primary pump with hydraulic flow and is connected to the input shaft at the front end, the secondary pump, and the primary and secondary stators. All five rotating elements are of aluminum castings produced by the Antioch plaster mold process.

The torque converter has been designed to take best advantage of the torque and horsepower curve of the Buick Series 70 engine. The torque converter is of reaction type; the reaction blading is curved in reverse direction from that of the primary pump and the turbine blading is contained in the two stators in the lower segment of the fluid circuit.

## Stators Can Free-Wheel

The innovation developed by Buick lies in the fact that the reaction blading of the stators is fixed when torque multiplication is required in starting, accelerating and under certain other conditions, and is permitted to free wheel when the torque converter operates as a fluid coupling in direct drive. Similarly, the secondary pump is mounted on a free-wheeling clutch to permit it to overrun the speed of the primary pump when torque multiplication is required. However, when the converter shifts to fluid coupling operation, a component of pressure flow through the vanes forces the free-wheeling clutch to lock and fixes the pump to the primary pump hub so that both rotate at the same speed. This increases the efficiency of the system markedly over known torque converter designs, according to Buick engineers.

Under heavy loads and acceleration, when the car is started, the primary pump is absorbing the full output of the engine while the secondary pump is over-running, since the velocity of the oil in this pump is greater than in the primary pump. By the over-running action turbulence is avoided and pump efficiency is correspondingly increased. In effect, the over-running secondary pump gets out of the way and allows the fluid from the stators to enter the primary pump in the most advantageous direction.

For steady driving and high speed operation, the vortex flow is at a minimum, and the oil no longer impinges on the back of the secondary pump vanes. The converter has become a fluid coupling to all intents, and at this point

added oil capacity is essential to maintain maximum efficiency. Hence the secondary pump stops over-running and becomes fixed to the primary pump by the effect of a component of pressure acting on the outer section of the reaction blade. The secondary pump now rotates at the same speed as the primary pump. This transition is smooth and gradual, and depends entirely upon torque requirements.

## Turbine Has Three Stages

Meanwhile there are two stators, also mounted on free-wheeling clutches, and designed to operate in three stages. In the first stage—starting the car, heavy loads and acceleration—as the turbine picks up speed and approaches the speed of the primary pump, maximum torque multiplication is required, and the stators must absorb large reaction forces. To this end the stators are held stationary by the locking action of the free-wheeling clutches (owing to the pressure exerted by a vertical component of fluid flow) and thus are locked to the reaction shaft which is held solidly in the transmission case. Both stators remain stationary so long as rapid vortex flow exists and high torque multiplication is required.

In the second stage—medium loads and light acceleration—as the turbine picks up speed and approaches the speed of the pump, oil flow gradually changes from vortex to rotary flow with a consequent decrease in reaction forces, and finally a point is reached when the secondary stator no longer carries load. As the reaction forces, which held the secondary stator locked, disappear the stator becomes unlocked and starts to free wheel.

In the third stage—light loads and steady driving—the change taking place in the second stage continues as the need for torque multiplication diminishes. When the turbine has reached approximately 85 per cent of the pump speed, the reaction forces disappear entirely and both stators free wheel. The second and third stages of stator operation are designed to take full advantage of engine characteristics while at the same time providing a smooth transition from torque converter to fluid coupling operation.

## Planetary Transmission

The transmission section of the Dynaflo consists of the: planetary gear unit for direct drive, reverse, emergency low, and neutral; oil supply; pumps for circulating oil; hydraulic controls; and an oil cooler.

The planetary unit with spirally cut gears, shown in Fig. 3, is composed of

a driving sun gear, a low range reaction gear with its band, three low planet pinions, three reverse planet pinions, a reverse ring gear and band and a planet carrier. In addition there is an hydraulically operated multiple-disc clutch for direct drive, low range clutch drum and band, an input shaft from the torque converter, and output shaft delivering power to the axle.

In direct drive the hydraulically operated multiple-disc clutch is engaged to make a solid connection between the low drum and input shaft, locking the low range reaction gear to the input shaft. Since both the driving sun gear and low range reaction gear are fixed on the same shaft, both turn in the same direction preventing rotation of gears and forcing the entire planetary to turn as a unit. The driving ratio is then one to one.

## Reverse Drive

For reverse it is necessary to turn the planet carrier, which is part of the output shaft, in opposite rotation to the input shaft. While the driving sun gear and reverse planet pinions always rotate in the same direction, the shafts on which they are mounted can be made to reverse the direction of the planet carrier. When a locking pressure is applied to the reverse ring gear band, the gear is kept rotating and introduces a stationary gear which is in mesh with the reverse planet pinions. Power is applied through the input shaft and driving sun gear, and, in this instance, the low planet pinions act only as idlers to give proper direction of rotation. Since the reverse pinions cannot turn the now stationary ring gear, they turn freely within the ring gear and force the planet carrier to turn in reverse direction. At this stage there is a gear reduction of 1.82 to 1.

For emergency low, the planet carrier and input shaft turn in the same direction but with a gear reduction of 1.82 to 1. The low range reaction gear is fixed to the low drum but not to the input shaft at the time when the low band is applied. The driving sun gear turns with the input shaft and, in turn, is driving the low planet pinions. These are transmitting power to the reverse pinions which are in mesh both with low pinions and low range reaction gear, the latter being held stationary. Low pinions serve only as idlers while the reverse pinions transmit low speed forward motion. Since the reverse planet pinions cannot turn the stationary low reaction gear, they turn freely around it in the same direction as their own rotation and thus move the planet carrier.

(Turn to page 60, please)



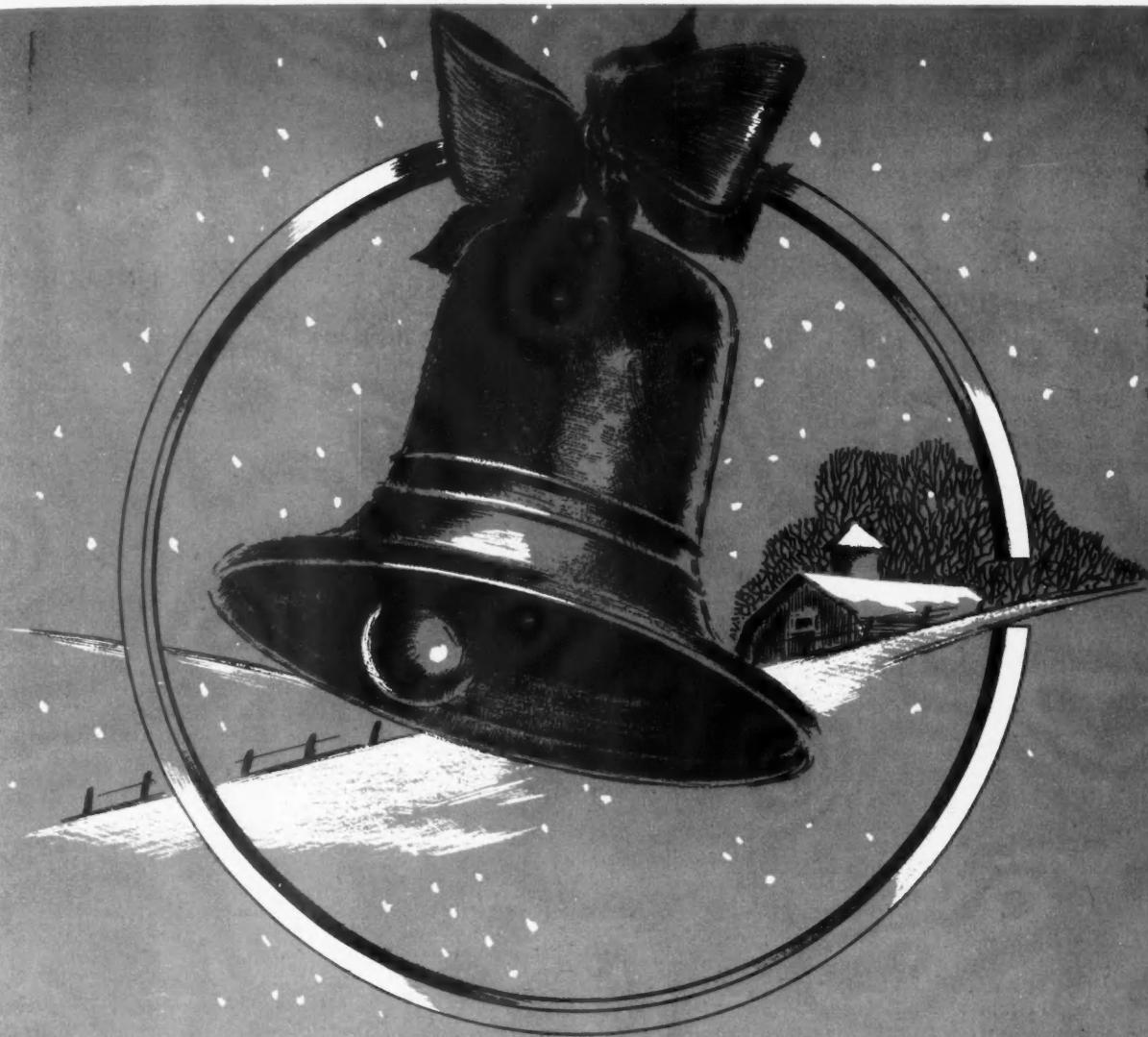
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### H-13—Die-Casting Machines

The Hydraulic Press Manufacturing Co.—Bulletin 4805-A, a 12-page illustrated booklet, describes new smaller capacity diecasting machines for both zinc and aluminum alloys. Complete details and specifications are included for the 150-Z, submerged plunger injection machine for lower melting-point alloys, and the 150-A, cold-chamber injection machine for aluminum and magnesium.

### H-14—Tapping Machine

The Cleveland Tapping Machine Co.—The new Model E Cleveland Lead Screw Tapping Machine is described and illustrated in a 12-page bulletin. Design features are given. The various sizes of the machine are pictured, together with a cutaway drawing, specifications and a list of optional equipment.

### H-15—Tantalum

Fansteel Metallurgical Corp.—In a new 20-page illustrated booklet, The Metal Tantalum, physical, chemical and electrical properties are tabulated

and discussed, comparisons with better-known metals are made in many instances. Discussions on workability, weldability, machinability and fabricating techniques are included.

### H-16—Ball Bearings

The Federal Bearings Co., Inc.—A new 260-page ball bearing catalog, No. K, is available, containing engineering information and data. The first section describes and illustrates all the many types of anti-friction bearings produced by Federal and contains interchangeability and conversion tables. The Engineering Data section has detailed information on calculation of loads, various bearing load conditions, a load modifying chart, lubrication and care of bearings, and various formulas, tables and equivalents. The final section contains information on aircraft bearings made by Federal.

### H-17—Carbo-Nitriding Furnaces

Holcroft & Co.—A 4-page illustrated bulletin briefly describes the operation of the Holcroft-developed process and lists numerous possible furnace design

features. An outline is given of the procedure of designing each furnace individually for its specific application. Typical production carbo-nitriding installations are illustrated and described.

### H-18—Scrap Cutters, Stock Feeds, Stock Straighteners

Haller Machine & Mfg. Co., Inc.—A new folder illustrates and describes in detail the Haller Model D-600 Hydraulic Stock Feed, Model D-610 Stock Straightener and Model D-611 Scrap Cutter, for use on punch presses with all stock to 3/32-in. thickness and 4-in. width. Controls and adjustments are identified and operating features are explained. Complete specifications are also included.

### H-19—Electric Fork Truck

Crescent Truck Co. — A 6-page bulletin illustrates and describes the new Crescent Electric Palletier Model MGVH in 3000 and 4000-lb capacities. Included are charts of load lengths for each capacity, dimensional drawings and complete specifications.

### H-20—All-Metal Flexible Hose

Titeflex, Inc.—A new loose-leaf booklet is available describing and illustrating Titeflex all-metal flexible hose for automotive gas lines, oil lines, air lines and oil filter lines. Price lists are included.

(Turn to page 82, please)

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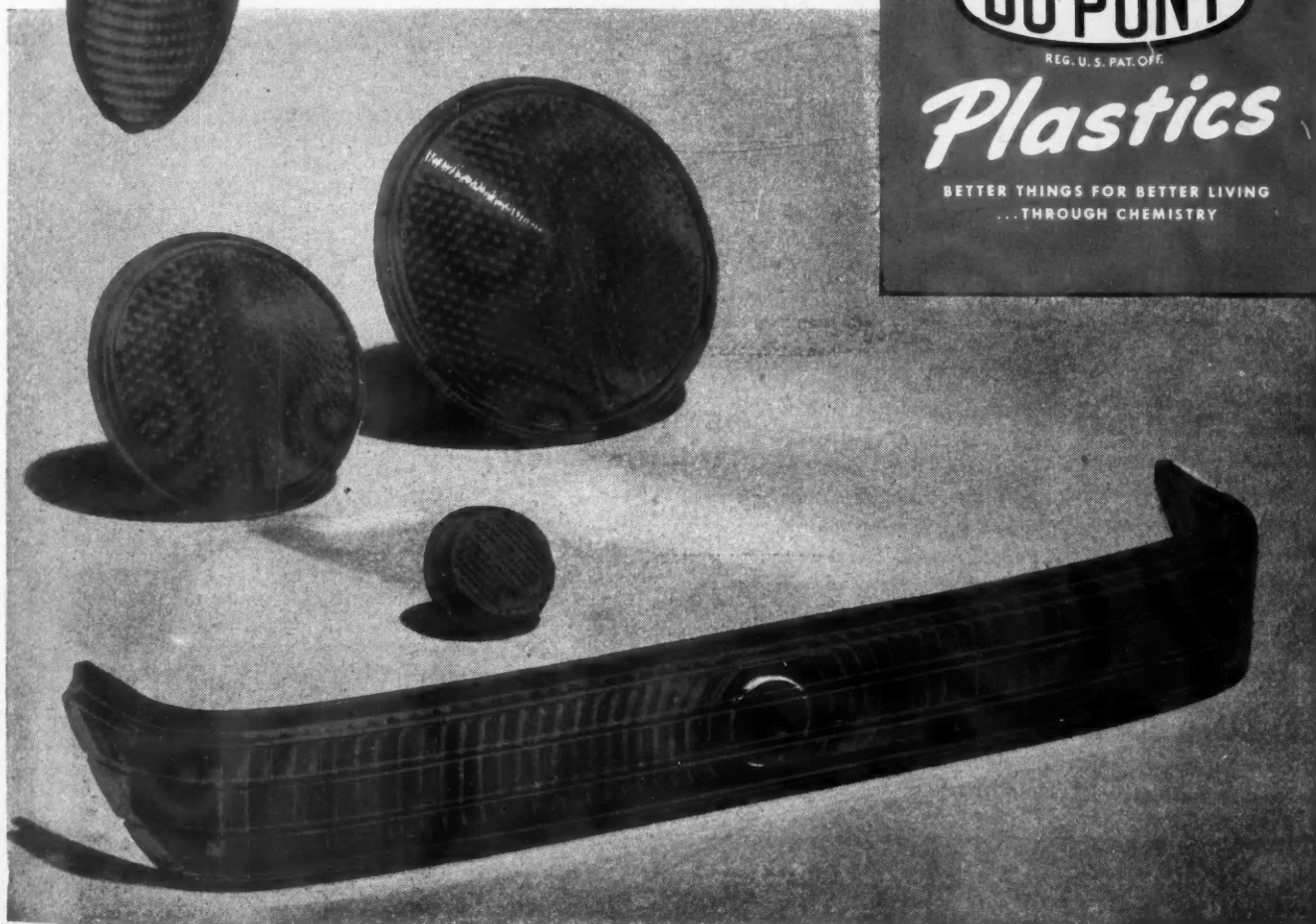
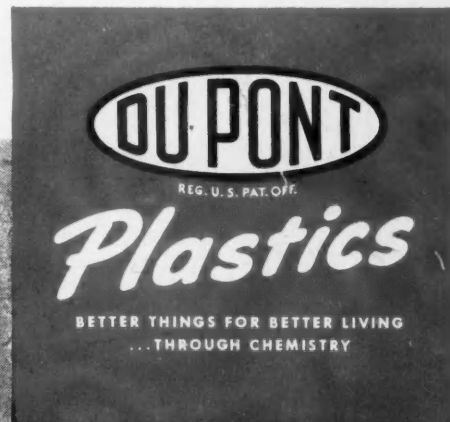
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**Left**—Tail-light lens molded of "Lucite" by Franklin Plastics, Franklin, Pa. **Below**—Stop-light lens molded by Electric Auto-Lite Corp., Bay City, Michigan; reflector lenses molded by Stimsonite Plastics, Chicago, Division of American Gas Accumulator Company.



## Buick's Dynaflow

(Continued from page 56)

In neutral there is no rotation of the planet carrier, and all functions such as the direct drive clutch, low and reverse bands are free. Since there is no reaction member within the planetary to provide positive drive, all gears spin freely around their own axes and no motion is imparted to the pinion shafts. A neutral safety switch is provided to prevent engagement of the starter while in direct drive, low, or reverse.

The oil supply system contains 11 qt

of a special Dynaflow oil in the oil sump and the converter—eight in the converter when operating, the rest for maintaining lubrication and operating the hydraulic controls. This entire supply is constantly circulated through a cooler which is connected by plumbing to the engine cooling system.

The transmission is provided with two oil circulating pumps of internal gear type. The front pump is of greater capacity, and is driven by the engine to afford positive circulation at the start. The rear pump is essential for operating the direct drive clutch when pushing or towing the car to

start the engine. It is of smaller capacity because its output is not fully required until road speed is around 45 mph. At that stage, the rear pump takes over completely, permitting the front pump to free-wheel without adding load to the engine. A master pressure regulator and check valves control the output of both pumps. Depending upon operating conditions, either one or both of the pumps is in action.

The control lever under the steering wheel is connected by a linkage to the shift control valve in the hydraulic control system within the transmission. In parking position the control lever operates a mechanical locking device, consisting of a pawl anchored to the transmission case engaging a ratchet wheel splined to the output shaft, thus preventing movement of rear wheels. A neutral safety switch is provided in the shift detent to prevent engagement of the starter except in parking or neutral. The control lever must be lifted upward when moving into neutral, parking, or reverse to prevent accidental shifting into these positions while the car is in motion. Within the hydraulic control system, the shift control valve is manually operated to line up the oil passages that feed oil to the direct drive clutch and reverse and low bands.

The master pressure regulator valve, controlled by oil pressure acting against calibrated spring pressure has the following functions: controls oil pressure to the various operating units of the transmission; controls the output of the front and rear transmission pumps; keeps the torque converter full of oil under pressure while the converter is operating; and restricts oil from draining out of the converter when it is idle.

The control system includes other elements such as pump check valves, high and low pressure accumulators, low band anchor valve, low and reverse serve pistons, all playing an important role in the functioning of the transmission under specific operating conditions. Proper combinations of these are selected automatically at the command of the manual shift lever. Buick has developed circuit charts to depict the events for almost any maneuver that may occur in the operation of the car, as shown by Fig. 4.


When starting and at low speed, the front transmission pump is in operation and supplies the entire hydraulic system with oil. During this maneuver oil flows from the front pump to a Y connection between the pressure regulator valve and shift control valve, pressure being maintained at 90 psi. From a port in the shift control valve the oil is directed to the back of the piston in the direct drive clutch to engage the clutch pressure plates. At the same time oil is metered from another port in the valve to the converter.

At 45 mph and over, the cycle of events undergoes some significant changes. The rear transmission pump now takes over, leaving the front trans-

(Turn to page 62, please)

# ROCKFORD

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TRICO PRODUCTS CORPORATION, BUFFALO 3, N. Y.

## *Windshield Washers*

**Fully Automatic • Nothing to Pump**

## Buick's Dynaflow

(Continued from page 60)

mission pump idle and load-free. Before this occurs the rear pump must build up sufficient pressure to keep open the front pump by-pass port in the regulator, thus permitting the front pump to idle and discharge into the sump. Any build up of pressure over 90 psi from either pump compresses the regulator spring and by-passes oil directly to the sump.

To prevent the working pump from bleeding into the idling pump at any

time, check valves are placed in each pump pressure line. When starting, the front pump check valve is open while the rear pump check valve is closed. Between approximately 20 and 45 mph both pumps are functioning to some degree.

To assure smooth operation still other controls are necessary. This is accomplished in the case of clutch engagement by provision of the high accumulator (see Fig. 5) in the clutch pressure line to permit a large flow of oil up to the point of engagement, then a reduction in flow during the final stage of engagement. This operation can be described as follows: oil flows to the accumulator from the shift con-

trol valve and enters around the neck of the dump valve, flowing rapidly through accumulator ports to the back of the clutch piston. While the clutch is being filled, one small port in the head of the dump valve and two small ports through the shoulder of the valve permit oil to bleed above and below the valve for equalizing pressure to prevent any movement. Rapid filling continues up to the first stage of engagement.

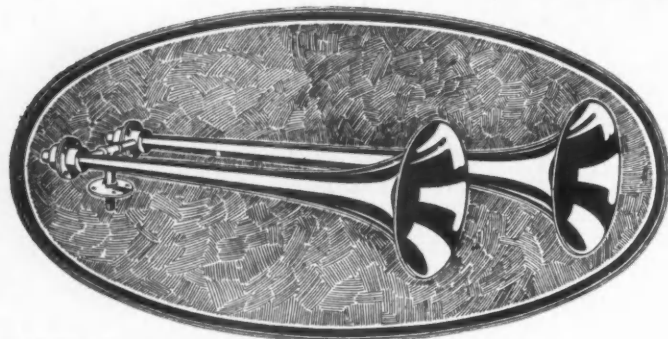
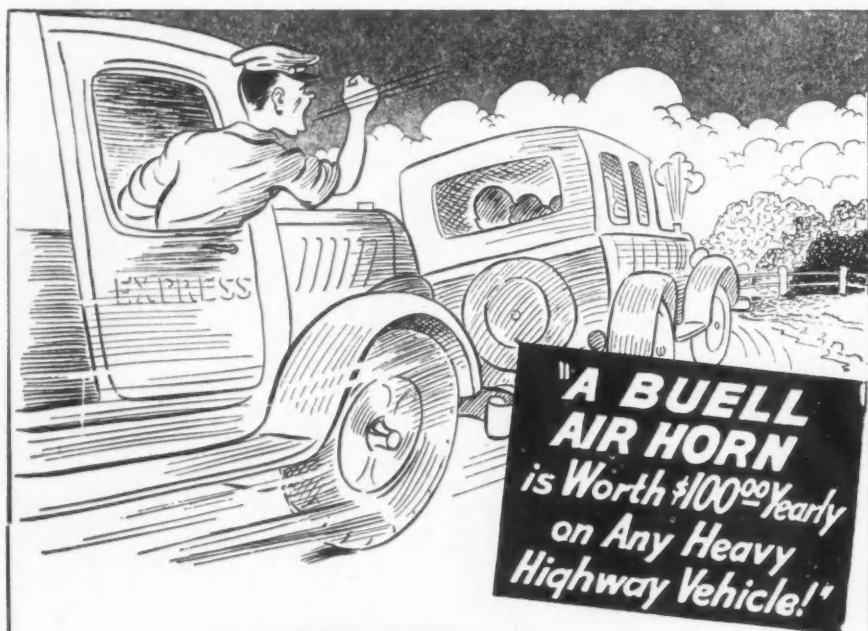
As soon as the clutch piston is filled and engagement begins, back pressure is built up in the accumulator to force its piston downward against a spring. This closes the large upper port so that the oil still flowing to the clutch for final engagement now is metered through the small port in the head of the dump valve. This metering action is said to account for the exceedingly smooth final clutch engagement.

When shifting out of direct drive, oil pressure from the shift control valve is released, thus opening to the sump the line from the accumulator to the control valve. Oil in the clutch then returns to the sump through the accumulator dump valve because of the pressure of the heavy clutch release spring. At the same time the dump valve is allowed to open wide because of the effect of size of the two bleed holes in the shoulder as contrasted with the smaller single metering orifice in the valve head. The bleed holes permit oil pressure to be immediately released, thus speeding clutch dis-engagement. Thus, it may be seen that the accumulator is instrumental in producing a rapid fill of the clutch piston, smooth final engagement, and instant dis-engagement of the clutch.

Another example is that of shifting from low to direct drive under heavy throttle. For this maneuver, the shift control valve shuts off the low relay line while maintaining pressure in the low serve, and opens the low apply line to the sump. At the same time oil pressure is directed to the clutch apply line through the low band anchor valve, this line by-passing the direct drive accumulator. When the direct drive clutch begins to engage it starts to rotate the low range drum to which the low band is still applied but in a direction opposite to the reaction forces that exist in low. This relieves the force on the anchor piston, permitting spring and oil pressure to return it to neutral position.

While the low servo line is connected with the low apply line which is open to the sump, it releases all oil pressure to the low servo and frees the low band, the oil pressure under the anchor pin being similarly relieved. Delayed release of the low band while the direct drive clutch is engaging permits smooth transfer of power from low to direct without allowing the engine to race. With the return of the anchor valve to its neutral position, the by-pass pressure line to the direct drive clutch is shut off, thus permitting oil to the clutch to continue to feed through the

(Turn to page 64, please)



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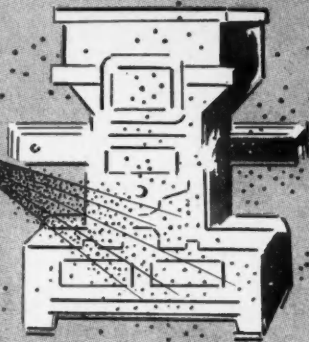
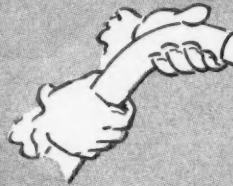
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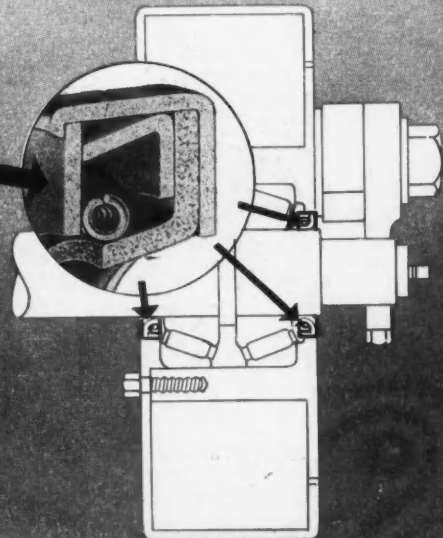
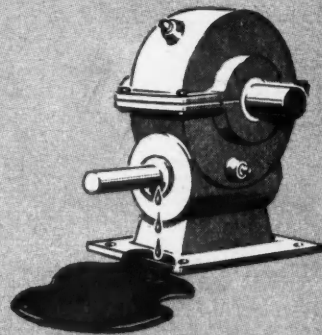
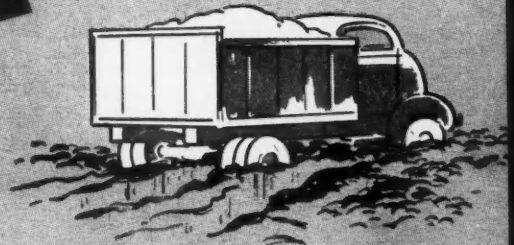


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## Buick's Dynaflo

(Continued from page 62)

direct drive accumulator to achieve smooth clutch engagement.

For operation in reverse, the system relies entirely upon the front transmission pump for oil circulation, this maneuver requiring a pressure of 180 psi obtained by directing oil pressure to the reverse servo piston and the second boost changer in the pressure regulator valve. Pressure directed to the reverse servo applies the reverse brake band, the application being made

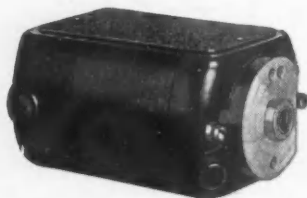
through an operating lever, a strut and solid anchor attached to the case. It is of interest to note that oil from the master pressure regulator valve is fed to the converter through a restricted metering orifice. It flows to the converter around the outside of the reaction shaft and is fed into it between the primary stator and secondary pump. Oil leaves the converter between the secondary stator and turbine and flows inside the reaction shaft to a passage in the reaction flange. From this point oil flows through the oil cooler to a converter pressure valve set at 35-40 psi. Oil is said to be cooled to a satisfactory operating temperature by

water-cooled heat exchanger.

For lubrication, oil is continuously passed through either a bleed hole in the converter pressure valve, or through the valve itself, and fed into the lubrication system at a pressure of 15 psi. If pressure exceeds this value the lubrication pressure regulator valve opens and permits oil to escape to the pump suction line. The lubrication system consists of two main lines—front and rear, the front line feeding the low range drum bushing and clutch plates, while the rear line feeds the rear transmission case bushing, planetary gears and carrier, transmission rear bearing retainer bushing, and universal joint. The pilot bearing on the input shaft and the free wheel clutches are lubricated by immersion.

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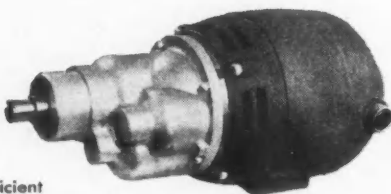


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## Overdrive Control

(Continued from page 39)

interrupter switch must also be closed by depressing the clutch to allow current from the battery to flow through the selector switch to the selected solenoid coil in the selector valve.

The selector valve, shown in Fig. 5, consists of an annular valve body containing a central vacuum chamber, two annular valve chambers arranged with inner and outer valve seats, two atmospheric chambers, two solenoid coils to operate the valves, and vacuum connections to the intake manifold of the engine and to the overdrive control cylinder. Provisions also have been made for speedometer correction. Ports lead from the annular valve chambers to the speedometer corrector, as shown in Fig. 1. The arrangement of this selector valve is such that the speedometer corrector and the opposite sides of the piston of the overdrive control cylinder are normally subject to atmospheric pressure. Energizing the overdrive solenoid coil, through operation of the selector and interrupter switches, actuates a valve to introduce manifold vacuum into the overdrive control cylinder. This effects overdrive engagement through the action of the control cylinder piston and an operating lever.

### Operation

When the shift handle is moved up from the third gear engaged position, it draws the cross-pin upwardly until it strikes the unindented edge of the cross-slotted hub of the low and reverse shifting arm. Further upward movement of the shift control shaft, by virtue of the slot and spring arrangement of Fig. 4, is sufficient to compress the selector switch spring. This will break the circuit from the interrupter switch to the standard drive solenoid, and make the circuit from the interrupter switch to the other solenoid coil.

When the clutch pedal is depressed, the interrupter switch will be caused to close, and the circuit will be completed

(Turn to page 67, please)

## Overdrive Control

(Continued from page 64)

from the battery through the interrupter switch to the selector switch and to the overdrive solenoid valve coil. As the other solenoid coil is in a broken circuit, its spring will cause it to remain in its inner position where it closes its inner valve seat and opens its outer valve seat, as shown in Fig. 5. The energized overdrive solenoid coil will move its valve away from the inner valve seat and against the outer valve seat.

This disposition of the valves causes the vacuum chamber to be connected to the left of the overdrive control piston (with respect to the vehicle of Fig. 1.). Likewise, the atmospheric connection to the two outer chambers is broken from the annular valve chamber. However, this atmospheric pressure in the right hand solenoid chamber can pass to the right side of the control cylinder. The atmospheric pressure will thereby act against the piston and move it to its left hand position. This establishes the overdrive gear ratio.

When the clutch pedal is released, and during the initial part of the releasing movement, the design of the cam of the interrupter switch effects a definite time delay in the operation of the switch. This delay or lost motion has the advantage that the interrupter switch remains closed through a substantial part of the clutch pedal cycle. If the shifting lever is operated concurrently with a clutch pedal operation, there is ample interval of closure of the interrupter switch for the shifting of the selector switch to be completed and for the operation of the selected solenoid valve and the consequent movement of the control piston and shift of the overdrive mechanism to be completed.

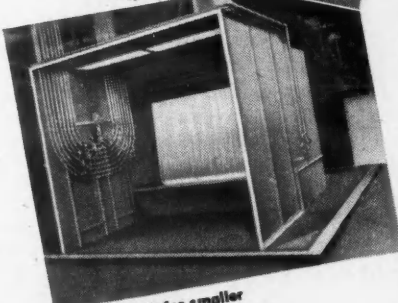
When the clutch pedal is released, and the shifting lever is released with overdrive established, the lever will be returned to its third gear position under the action of a spring in the control shaft. This will return the selecting finger of the selector switch to its former position to close the circuit from the interrupter switch to the standard drive solenoid coil. The mechanism is then preset so that, upon a subsequent full declutching cycle if the shifting lever remains in released position, the overdrive will be automatically shifted back to standard drive condition because the declutching operation closes the interrupter switch and completes the circuit through the selector switch to the selector drive. If it is desired to hold the overdrive in its overdrive condition, despite a declutching operation, the shifting lever may be moved and held in its overdrive position while the clutch pedal is depressed and returned, or the clutch pedal may be adjusted to release the clutch before the pedal is down far enough to close the interrupter switch.

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## Knock Free Operation

(Continued from page 33)

call for an explanation. Straight-run fuels for the most part are paraffinic in nature and contain a higher percentage of hydrogen than cracked stocks which have appreciable percentages of aromatics and olefins. These straight-run paraffinic fuels burn with a clean, blue flame, whereas cracked fuels burn with the production of an oily, sooty smoke. In engine operation this latter type of combustion results in combustion-chamber deposits.

This difference between the combustion characteristics of straight-run paraffinic and cracked or reformed gasolines with large non-paraffinic contents has been confirmed experimentally in several ways, and also in service. A good deal of the benefit expected from the injection of anti-detonating fluid combined with the use of straight-run paraffinic fuels is based on these better combustion qualities. These fuels could not be used in modern automotive en-


gines without the injection or addition of anti-detonants, because of their low octane numbers. Injection of such fluids as water and alcohol also results in lowering engine operating temperatures. Beneficial effects of the lower operating temperatures on the one hand and the cleaner combustion of the straight-run fuel on the other are said to include a reduction in cylinder wear, in oil consumption, and in fouling of spark plugs, and elimination of varnish on pistons and cam followers and of clogging of screens in the lubricating system by sludge. These gains were confirmed in test runs over 6000 miles simulating a milk-delivery service.

The anti-detonant fluid Vitol, as already mentioned, contains water, alcohol and tetraethyl lead. It is injected into the inlet manifold of the engine by the Vita-Meter, but only when the engine is operating under full or nearly full throttle. Fig. 2 shows a sectional view of a Vita-Meter and how it functions. Under conditions of low-throttle operation the manifold depression acts on a diaphragm in the Vita-Meter and shuts off the flow of fluid. Restriction of injection to a small part of the operating range reduces the consumption of fluid and makes for economy. Any one of the alcohols of low boiling point may be used, but preference is given to methanol, both because of its greater latent heat of evaporation—which results in greater cooling of the mixture and a greater anti-detonating effect—and its lower price. Methanol, however, is the most volatile of the alcohols, and under certain operating conditions it may be necessary to replace it in part by isopropanol, to raise the boiling point of the fluid and prevent vapor lock in the system. Isopropanol has a boiling point of about 180 F, as compared with about 150 F for methanol. Another consideration that may compel the use of isopropanol in certain cases is that just now there is a shortage of methanol, which is used largely as an automobile antifreeze.

Tetraethyl lead, which is soluble in alcohol, is added to the fluid to further increase its anti-detonating effect. It has been found that to dissolve 3 cc of tetraethyl lead in one gallon of the alcohol-water fluid requires a methanol content of 73.5 per cent, an ethanol content of 55.1 per cent, or an isopropanol content of 38.5 per cent. Considerable experimentation was conducted to determine the best composition of the fluid, the objects aimed at including maximum anti-knock effect in proportion to alcohol consumption and quantity of liquid injected, and minimum tendency to vapor lock in the system. As a result of these experiments the following tentative formula for the fluid was decided upon: 85 per cent alcohol (of which at least 50 per cent should be methanol), 15 per cent water, and 3 cc tetraethyl lead per gallon. The following table shows the gain in octane value resulting from injection of fluid of this composition, in various proportions. (Turn to page 70, please)

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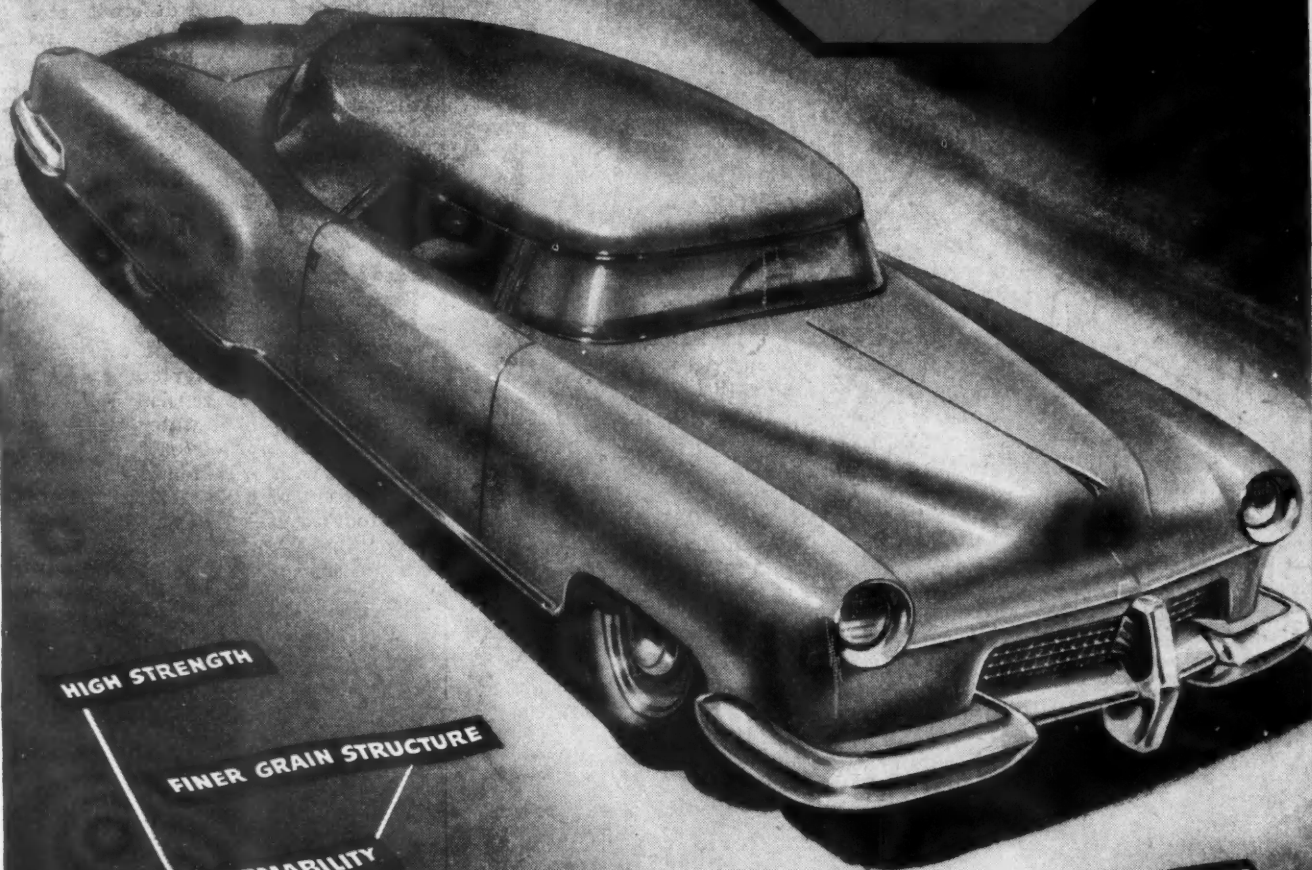


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Unit of National Steel Corporation

## Knock Free Operation

(Continued from page 68)

tions to the full-throttle fuel consumption, in different vehicles:

Vehicle	Road Octane Results With Vitrol Injection		Im- proved ment
	Requirement	Octane Solution	
Dodge Truck Model WK 47 .....	82	10.0	17
		20.5	27
		30.8	34
Chevrolet Truck 46 .....	84	11.2	16
		18.6	26
		30.5	30
GMC Truck Model 300 '46 80		11.3	12
		20.0	22

Pontiac '46, 7.5 compr. ratio .....

85  
9.3  
11  
22  
20.0  
31  
30.5  
12  
19.2  
20  
9.5  
14  
10.3  
13.7  
19.7  
23.4  
30.6  
31.7

Chevrolet Sedan '46 .... 76  
Ford Truck, '47 ..... 67  
Average .....

\* Per cent of gasoline at full throttle.

The figures given in the accompanying table were arrived at by the standard acceleration method for octane re-

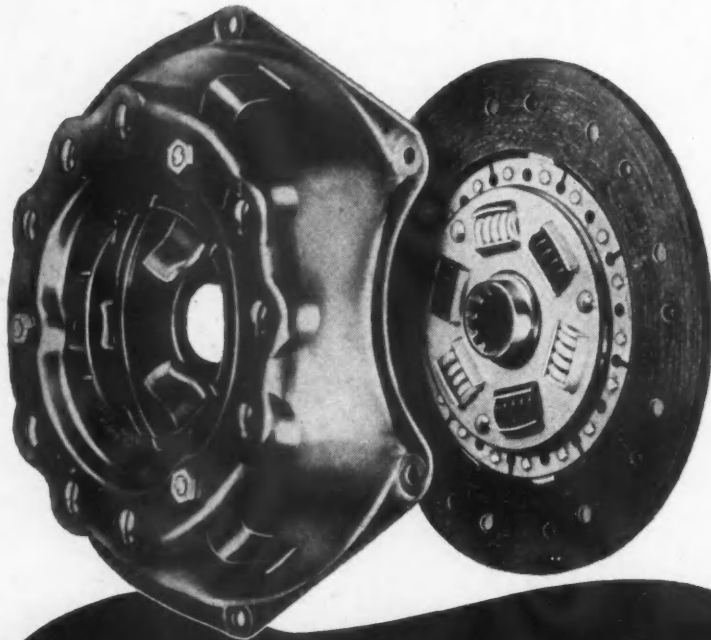
quirement. The effect of fluid injection may be looked upon as effecting a reduction in the octane requirement of the engine.

One of the factors determining the commercial value of the system is the cost of the anti-detonant, which depends on its rate of consumption. As already stated, fluid is injected only when the engine is heavily loaded, hence the overall proportion of anti-detonant or fluid consumption to fuel consumption is much lower than the proportion during periods when fluid is actually being injected. The fraction of the operating time during which fluid is being injected is less in so-called light-duty than in heavy-duty trucks. Some results of road tests to determine the consumption of Vitrol for different rates of injection in proportion to full-throttle fuel consumption and the "octane number improvements" corresponding to these rates of injection are plotted in Fig. 3. From the scales at the bottom of the chart it will be seen that the ratio of Vitrol to gasoline consumption was found to be 40 per cent less in light-duty than in heavy-duty vehicles. The "total-consumption" figures for heavy-duty vehicles were determined in service tests on several hundred trucks and buses, including an oil-company delivery fleet operation in a Metropolitan area. These latter trucks used an anti-detonant fluid consisting of 50 per cent isopropanol in water, which gave an "octane improvement" of 8 to 12 numbers with injection rates of 20 to 25 per cent of the gasoline flow. During four months of operation the consumption of anti-detonant fluid figured out to 5.5 per cent of the fuel consumed. The cross-hatched area in Fig. 3 represents these results. These trucks previously had been operating on a housebrand gasoline showing 76 octane by the A.S.T.M. method, and 83 by the Research method. After the Vita-Meters had been installed the fleet was operated on a fuel showing 60.5-63.5 octane, and there is said to be no apparent loss in freedom from knock.

Injection of an anti-detonant solution containing 85 per cent of alcohol and 15 per cent of water increases the engine torque by from 1 to 2 per cent. This is due to the cooling effect of the anti-detonant, which enables the engine to draw in a somewhat larger charge of air and fuel. If this additional torque is not needed and more importance is attached to economy than to superior performance, the spark advance of the engine can be reduced. That reduces the "octane requirement" of the engine and permits of reducing the quantity of anti-detonant injected by about one-third.

The chief item of operating costs with anti-detonant injection is represented by the cost of the alcohol consumed. If the fuel used has an octane number of 60, in most services an "octane improvement" of 15 would be required. From Fig. 3 it can be seen

(Turn to page 72, please)



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## Knock Free Operation

(Continued from page 70)

that with heavy trucks this can be achieved with a maximum rate of injection of 11.5 per cent, and an average rate of injection of 2.87 per cent of the rate of fuel consumption. In other words, 2.87 gallons of alcohol would be burned for every 100 gallons of gasoline consumed. For light-duty trucks and passenger cars the average proportionate rate of anti-detonant in-

jection, and hence the relative cost, would be lower by 40 per cent, and a further saving of some 33 per cent could be made by retarding the spark to hold the engine down to its original power.

With Vitol injection there is said to be no danger of internal corrosion of the engine. One reason for this is that the fluid, on being injected, is atomized

and aerated, and since injection takes place only when the engine carries considerable load and is therefore hot, it is immediately vaporized, in which condition it has no corrosive effect. Corrosion of the container for the fluid and of the injection device is prevented by the addition of an inhibitor to the fluid, which has the incidental effect of preventing clogging of the injector orifice by impurities in the alcohol.

Aside from the advantage of the system that it permits of the use of a fuel that can be produced at somewhat lower cost, important gains are expected from reduced engine maintenance requirements. As stated above, the use of high burning quality gasoline eliminates the main source of sludge. Valve life and spark-plug life are said to be increased, and engine wear reduced because oil rings are less likely to become clogged. Tear-downs for oil-system cleaning need not be as frequent; engine power is increased, and so is the fuel mileage during winter months, because many straight-run fuels are more volatile. An additional advantage of straight-run gasoline is that it is practically gum-free.

It is planned to introduce the system among fleet owners by inducing petroleum refiners to sell the fuel to be used, to be known as Vitane, as well as the injection fluid, the Vitol. A group of competent fleet maintenance engineers with sales ability will be required to put the program into effect. It is figured that a service engineer will have to be in attendance for a week or two when a fleet first starts operating with Vita-Meter equipment, while thereafter one man will be able to look after the installations in about 20 fleets. The Thompson Vita-Meter Corp. is prepared to make the necessary sales-service effort. However, the cost of this service may have to come out of the gasoline or anti-detonant profits, as the Vita-Meter will be sold at such a low price that this service cost cannot be absorbed.

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## CALENDAR

### Conventions and Meetings

- Soc. of Automotive Engineers Annual Mtg., Detroit ..... Jan. 12-16
- Natl. Materials Handling Exposition, Cleveland ..... Jan. 12-16
- Natl. Auto Dealers Assoc. Exhibition, Chicago ..... Jan. 25-29
- Institute of the Aeronautical Sciences—Annual Mtg., New York ..... Jan. 26-29
- International Sports, Travel and Boat Show, Chicago ..... Feb. 27-Mar. 7
- Tool Engineers Industrial Exposition, Cleveland ..... Mar. 15-19
- Chicago Production Show, Chicago ..... Mar. 22-24
- The Inst. of the Aeronautical Sciences Natl. Flight Propulsion Mtg., Cleveland ..... Mar. 26
- Natl. Assoc. of Corrosion Engineers Mtg., St. Louis ..... Apr. 5-8
- Southern Mch. & Metals Exposition, Atlanta ..... April 5-8
- 32nd International 500-Mile Race, Indianapolis ..... May 31
- Natl. Air Races, Cleveland ..... Sept. 4-6

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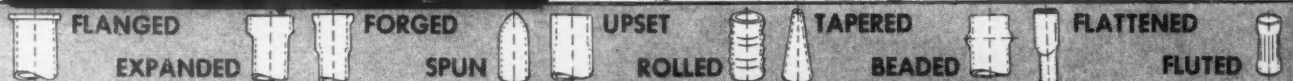
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Wide range of styles, sizes and strokes. 100 lb. to 12,000 lb. (direct) power movement.



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Automatically feed and set clinch nuts in automotive body panels, door locks, other products. Save time and labor.



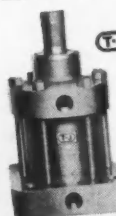
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For air cylinders in semi-automatic or automatic operating cycles.



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Many standard sizes and styles . . . both cushioned and non-cushioned types. 1000 lb. to 50,000 lb. (direct) power movement.



**TOMKINS-JOHNSON**

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

## Ford's Truck Line

(Continued from page 37)

recessed headlight in the right front fender admits fresh air for this air conditioning equipment. However, it can be used at all times to draw fresh air into the cab in regulated volume.

Another device contributing to good ventilation is a large-sized cowl ventilator fitted with an insect screen, rubber weather seals, and water drain. In addition, ventilating wings are provided in the windows of both cab doors—as standard equipment—and these can be adjusted to scoop fresh air and expel stale air.

Another feature contributing to driver comfort is the new "level action" cab suspension system, designed to insulate the cab from frame weave. It is a four-point suspension with rubber pads and rubber-insulated bolts at each front corner, and level action links operating in torsion-type rubber bushings at the rear corners.

On C-O-E's, Ford provides a lift-up hood and a new location of the dash for easier servicing. The engine cover is fitted in the cab floor, with an exceptionally low height when the six-cylinder engine is used. The cab support is of new design, featuring a rigid sub-frame.

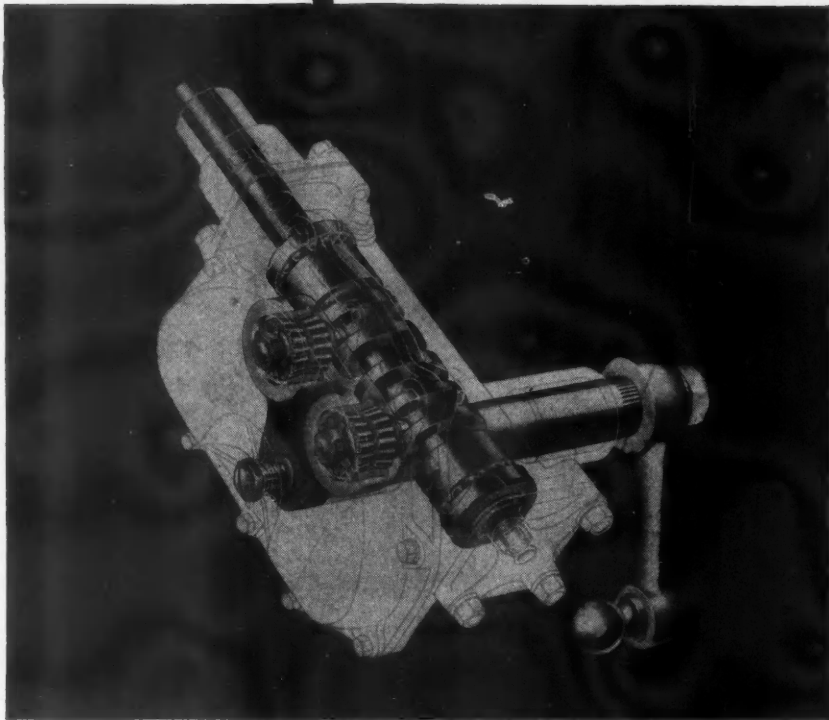
Greater front-end strength has been achieved through improved sheetmetal suspension and heavier construction. Fenders are heavier, wider and of a new design which provides greater tire clearance. Another design advancement is a heavy channel-steel front bumper attached directly to extended frame side rails. The bumper is, in effect, an extra cross member providing greater rigidity and impact strength.

The nominally rated  $\frac{1}{2}$ -ton series is offered in a deluxe delivery model, and with standard pick-up, panel, stake, and platform bodies. The  $\frac{3}{4}$ -ton regular and heavy duty series offers stake, platform, and express bodies, while the 1-ton series offers a stake and platform body and either single or dual rear tires.

Chassis improvements on the light and heavy-duty lines may be briefly summarized as follows: On Series F-1, F-2, and F-3 brake drums are of composite type designed to be quickly demountable. Front axles are redesigned to accommodate the new truck type fore-and-aft steering linkage and direct-acting shock absorbers. The steering arrangement is said to provide greater stability and better geometry. The drag link is short, direct-acting, and of solid type attached to the new demountable steering arm. Tie-rod ends are spring-loaded ball-socket type for automatic take-up of wear, fitted with dust shields.



# Steering AT ITS BEST



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## FOR ANY JOB . . . LARGE OR SMALL

● For 41 years Ross has anticipated and met the changing and increasing needs of automotive operation, with constantly improved steering gear designs. Based on the Ross exclusive Cam and Lever principle, there have been continuously many important refinements and perfections.

Experience gained through the use of Ross steering gears on military vehicles during world war II has led to current improvements such as:

(1) *Increased mechanical reduction . . .* (2) *More compactness of design . . .* (3) *Reduction in weight . . .* (4) *Greater arm angular-travel . . .* (5) *Improved metallurgy . . .* (6) *Increased efficiency.*

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# Ross

**Cam & Lever STEERING**

ROSS GEAR AND TOOL COMPANY • LAFAYETTE, INDIANA

## Super Octane

(Continued from page 26)

volume, would have a Research rating of about 83 with two ml TEL per gal.

On the subject of product distribution, the marketing of a third grade gasoline—a "super-premium"—is not feasible. Not only is the required capital investment excessive but, in addition, the materials required for the installation of additional pumps, lines and tankage at the refinery, bulk terminal and service station would have to be drawn from the same limited stocks now being used for the expansion of crude oil production and refining facilities.

Whether or not the industry will be in a position to maintain past trends in antiknock quality is a serious question and will continue to be for a period of years. Such improvements cannot be obtained simply by turning valves and readjusting operating conditions on equipment currently in use. All of it is now being operated at maximum to meet quantity demands. Refining facilities must be built to meet these increasing quantity requirements before emphasis can be placed upon construction for quality.

In order to produce still higher octane numbers, many refineries now substitute polyforming or hydroforming

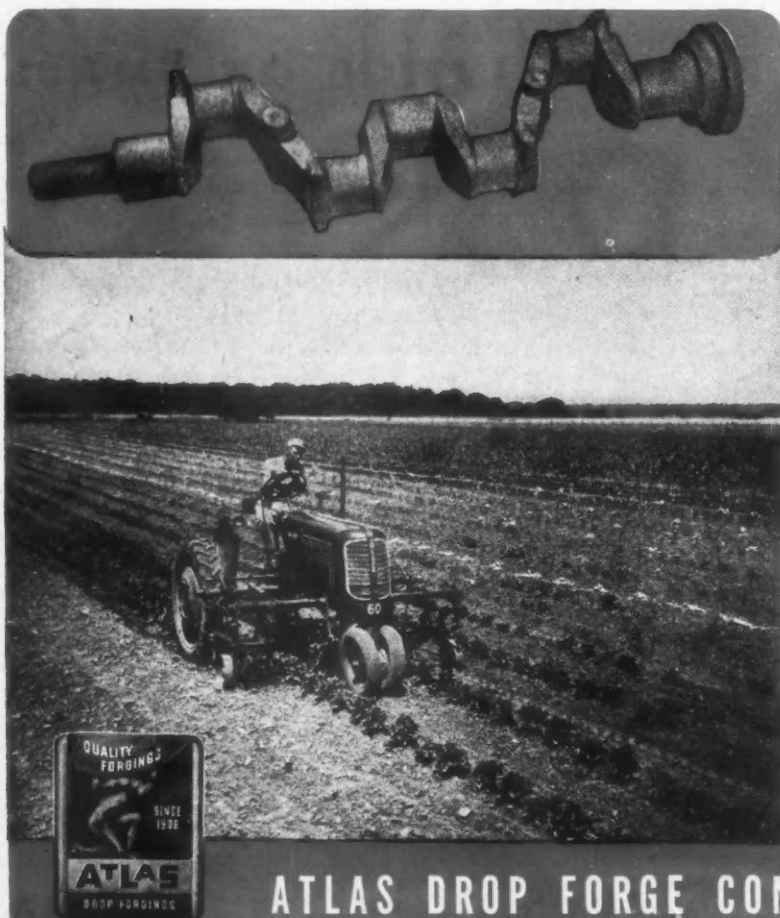
for thermal reforming. Both of these processes produce higher octane number gasoline than thermal reforming for the same loss in gasoline volume. Polyforming has the additional advantage that it can convert the heavier parts of the refinery fuel gas into gasoline, thereby eliminating the need, in some cases, for catalytic polymerization and alkylation. Hydroforming has the additional advantage for desulfurizing the gasoline, and therefore is of particular value in reforming high sulfur naphthas. A refinery using the preceding processing techniques and adding hydroforming for high sulphur naphtha (thermally reforming only low sulfur naphtha) can be built today for about \$72,000,000. The gasoline will approach an antiknock quality of 85/93 with one ml TEL per gal. Since both polyforming and hydroforming are reforming processes, the increased operating cost, investment, and decrease in product value must be charged against improved octane number and volatility.

Looking far into the future, it is possible to visualize a total refinery gasoline having an actane number of about 89/99 with three cc TEL per gal or about 87/97 with one ml TEL by hydroforming all the straight run gasoline and doing all cracking catalytically. Such a refinery will cost about \$90,000,000 for 100,000 bbl per day of crude oil capacity. About 20 per cent of the straight run gasoline will be lost in hydroforming and the operating ex-

penses will be very high.

In general, cracking processes and those converting the heavier parts of the fuel gas into gasoline produce low-cost octane numbers since the product value is increased. In contrast, the reforming processes produce high-cost octane numbers since product value is decreased. The investment required for today's octane numbers is high and will increase rapidly if higher antiknock quality gasolines are required. There are available rather impressive figures to prove this fact. During the war years \$927,000,000 were expended on major projects in refineries. Of this total amount \$864,000,000 were spent only on facilities for the production of 100 octane number aviation gasoline. The construction of catalytic cracking units accounted for the largest part of the investment, alkylation units a smaller portion, and lesser amounts for crude fractionating units. Charging capacity to catalytic cracking units increased to over 1,000,000 bbl per day. What was the effect of this huge expenditure for quality producing equipment on the octane number of motor gasoline? Fig. 4 answers that question. Between 1941 and 1946, premium and regular grades increased barely three octane numbers in spite of the fact that aviation fuel production had been largely diverted to motor gasoline by 1946. In other words an increase in overall fuel antiknock quality of one octane

(Turn to page 78, please)



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Atlas Drop Forgings have their important place in every farming implement, from plowing through harvesting. Their great strength with light weight frees engine power for field work, assuring maximum operating satisfaction.

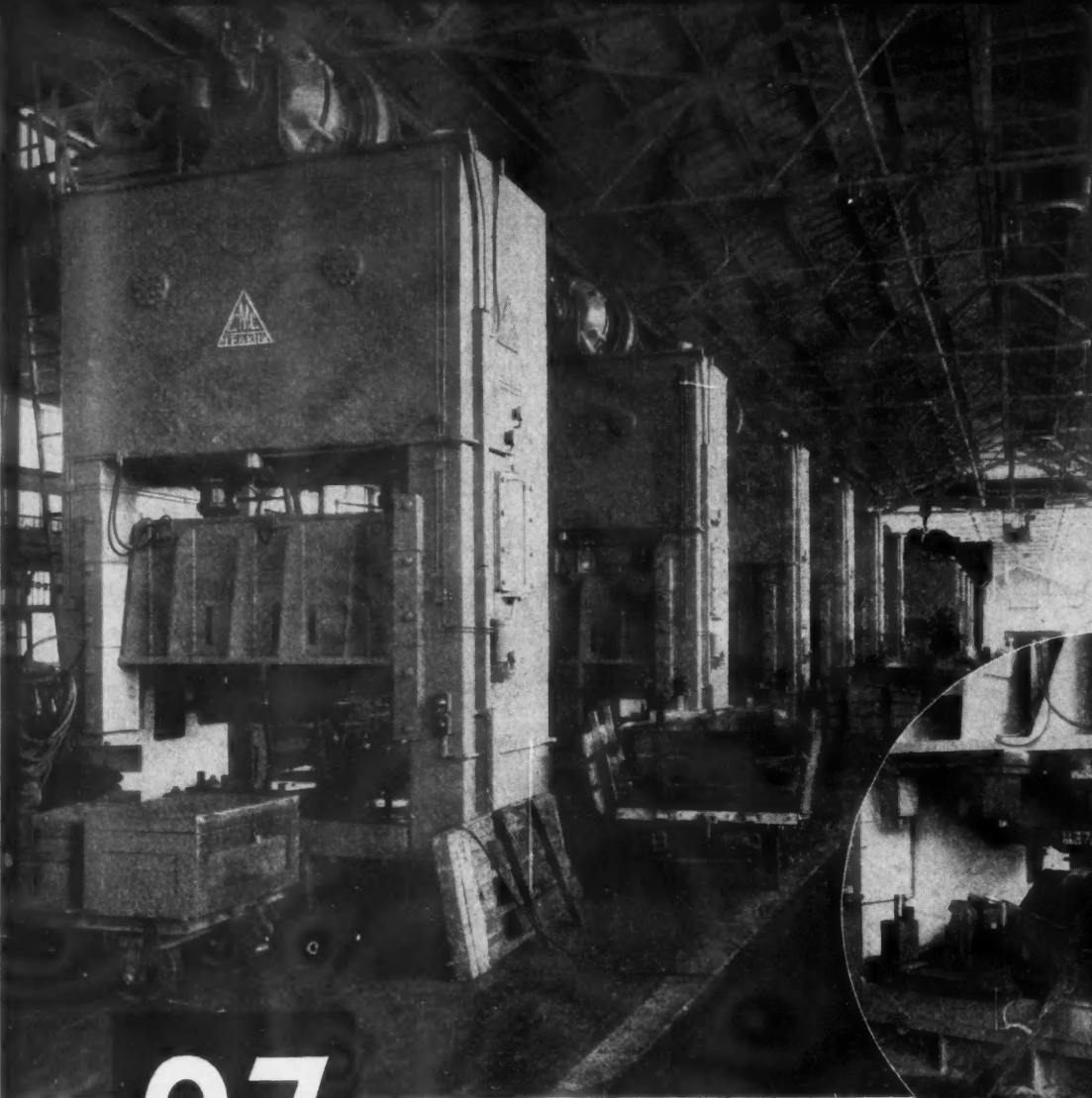
Atlas Drop Forgings also Excel in

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*Inset: Clearing's four-point suspension assures accurate alignment despite extreme unbalance of work load.*

# 27

## CLEARING PRESSES AT WILLYS-OVERLAND

**New, Up-To-The-Minute Stamping Facilities  
Give "Jeep" Maker Maximum Production Speed and Economy**



As an important part of their new set-up to fulfill demands for the popular "Jeep" vehicles, Willys-Overland recently installed 27 new Clearing presses to handle the body work on a broad line of automobiles, station wagons and trucks. It is estimated that the new stamping plant can process 8,500 tons of steel per month.

Since low weight is a particular Willys feature, this clearly represents mass produc-

tion of a high order—and that is Clearing's specialty. For Clearing presses are designed and built to turn out parts at minimum cost. No expense is spared in Clearing presses if a one-time expenditure can reduce the repeated costs of volume production. That's why Clearing presses are the economical buy for the plant that means business.

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**CLEARING MACHINE CORPORATION • 6499 W. 65th St., Chicago 38, Ill.**

# CLEARING

THE WAY TO EFFICIENT MASS PRODUCTION





## Super Octane

(Continued from page 76)

number did cost then in the neighborhood of \$300,000,000. Investment costs per octane number at present are about 50 per cent above the average of the period 1941-1945.

It is generally agreed that the refining industry must be expanded to handle another 1,000,000 bbl per day of crude in order to meet the anticipated demands, here and abroad, for petroleum products in the next few years.

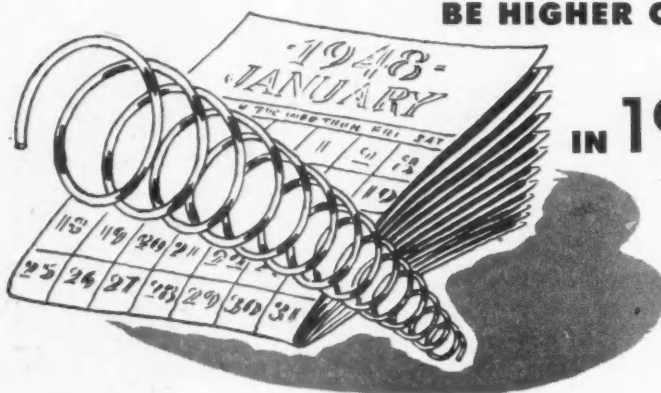
This expansion in refining equipment maintaining today's quality level and the required increase in distribution facilities will cost the industry about \$1,500,000,000 at today's prices, and following current price trends, considerably more at the time of installation. It will be recalled that an outlay of over \$2,750,000,000 will be required to find, produce, and distribute the additional crude oil to fill these demands. This total investment exceeding \$4,250,000,000 must be made to meet the anticipated demand for petroleum products and must, therefore, receive priority over investments aimed solely at improving the quality of products.

In addition to the limitations imposed by this huge expenditure to bring the production level of the petroleum industry up, there is a limit to the amount of refinery and crude producing equipment which can be installed in one year. Among the shortages causing this limit are steel, motors, pumps, compressors and skilled construction workers. Consequently the expansion in refining and crude producing capacity will take several years. It should be noted that, during the war years, refinery expansion proceeded at a rate of only \$250,000,000 a year. After the expansion is completed, further investments will no doubt be made to improve the antiknock quality of motor gasolines—but this will require several more years. The fact that significant increases in the octane number of motor fuels may be several years off should not in any way impede the progress that the automotive industry can make in designing and producing engines and cars with improved performance and economy. It is felt that a critical examination of the manner in which antiknock quality is utilized in present-day cars, and of the effect that various design changes may have on antiknock requirements will point the way to the goal desired by both the petroleum and automotive industries as well as the passenger car operator.

## Q. Will Your Spring Costs

BE HIGHER OR LOWER

IN 1948?



**A.** Higher prices on many parts and assemblies needed by the manufacturer present a serious problem in holding the price line on the finished product. Only by careful specification and purchase of materials can you achieve production economy. Unit costs can be controlled by taking advantage of the services of skilled engineers to assist you, without obligation.

Lewis Spring engineers have saved manufacturers thousands of dollars by recommending and supplying the most practical, as well as the most economical, springs for particular jobs.

Many times, Lewis engineers find manufacturers using expensive, close-tolerance springs where a more economical spring would serve the purpose just as well.

To lower your spring costs in 1948, have a Lewis representative check the spring requirements of the job to be done. He'll recommend a practical, economical spring design for you. No obligation, of course.

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**Lewis**  **PRECISION SPRINGS**  
THE FINEST LIGHT SPRINGS AND WIREFORMS OF EVERY TYPE AND MATERIAL

## General News

(Continued from page 23)

### New Amphibian Plane Undergoes Flight Tests

A new six-place amphibian, designated as the W-6 (Aqua I), has successfully completed preliminary flight tests, according to the manufacturer, Aquaflight, Inc., Wilmington, Del. The plane, which was designed to meet the need for a light twin-engine amphibian with moderate cruising speed and sufficient cargo space for general use, features a high-wing all-metal fuselage with a wooden hull provided with large seawings for water stability. The seawings house the main gear of the tricycle under-carriage. The Aqua I is powered by two four-cyl 125-hp Lycoming model O-209A engines, and is reported to have a cruising speed of 125 mph, a useful load of 1400 lb, and an estimated maximum range of 750 mi.

### Cars Avoid Salt Damage by Weekly Bath

A warning to motorists who drive in areas where salt is used to combat icy streets comes from E. L. Harrig,

(Turn to page 82, please)

### OIL CONSUMPTION WITH "X" BRAND RINGS

MONTH	HORSEPOWER HOURS PER GALLON
January 1947	1,600
February	1,800
March	1,500
April	1,360

### OIL CONSUMPTION WITH PEDRICK RINGS

MONTH	HORSEPOWER HOURS PER GALLON
June 1947	1,280
July	1,620
August	2,350
September	2,800

ENGINE BUILDER'S TESTS SHOW

# twice the work per gallon of oil

HERE'S A TEST that tells a BIG story in a few brief figures. A prominent manufacturer, in selecting original-equipment piston rings for his line of industrial gas engines, made comparative performance tests using the two brands of rings he considered best. Both were tested in the same 8-cylinder, 6" x 9" vertical engine . . . with results as shown above.

Note that Pedrick performance actually grows *better* from month to month! At the end of four months of operation, the engine delivered *twice the work* per gallon of oil, when equipped with Pedrick rings.

Time and time again, engineers' tests prove our statement that Pedrick "Heat-Shaped" Piston Rings save oil, save fuel, reduce maintenance costs, and maintain peak efficiency *longer*. WILKENING MANUFACTURING Co., Philadelphia 42, Pa. In Canada: Wilkening Manufacturing Co. (Canada) Ltd., Toronto.

WITH

**Pedrick**

**"HEAT-SHAPED"  
PISTON RINGS**

FOR 28 YEARS, SUPPLIER OF PISTON RINGS TO LEADING VEHICLE & ENGINE MANUFACTURERS

## Personals

*Recent Personnel Changes and Appointments at the Plants of the Automotive and Aviation Manufacturers and Their Suppliers.*

**General Motors Corp.**—**James E. Goodman** has been made General Manager of the Buick-Pontiac-Oldsmobile Assembly Div.

**General Motors Corp., Pontiac Motor Div.**—**Hugh J. Hales**, Service Manager, and **Eugene Foley** appointed Organization and Analysis Manager.

**General Motors Corp., Chevrolet Motor Div.**—**Ivan X. Sarvis** has been

appointed Asst. General Sales Manager.

**General Motors Corp., Allison Div.**—**E. B. Newill**, General Manager, has been elected Vice-President of the Indianapolis Chamber of Commerce.

**Chrysler Corp., Dodge Div.**—**E. C. Quinn** has been appointed General Sales Manager.

**Chrysler Corp., Dodge Div.**—The retirement of **F. H. Akers**, Vice-President and Director has been announced.

**Nash-Kelvinator Corp., Nash Motors Div.**—**E. E. Stephenson** has been named

Manager of the newly established Marketing and Analysis Dept.

**Willys-Overland Motors**—**Robert E. Bussey** has been appointed Asst. Chief Engineer.

**Crosley Motors, Inc.**—**John F. Crossin** has been made Manager of the company's Commercial Sales Div.

**Mack Trucks, Inc.**—**C. W. Hasteltine** has retired as Vice-President, Secretary and Treasurer. **F. W. Sommer** has been made Treasurer, and **T. V. Homan**, Secretary.

**Perfect Circle Corp.**—**Arthur Hopkins** has been appointed Asst. Sales Manager. **Kenneth Sloane** replaces Mr. Hopkins as Regional Manager in the northeastern states.

**The Lincoln Electric Co.**—**Thomas V. Koykka** has been appointed to the Board of Directors.

**General Electric Co.**—**Joseph F. Eckel** has been promoted to Manager of the Lynn River Works. He succeeds **George M. Stevens**, retired as of December 31.

**General Electric Co.**—**Henry V. Erben** has been elected a Vice-President and becomes General Manager of the Apparatus Dept. He succeeds **Roy C. Muir**, company Vice-President, who is retiring.

**Joseph T. Ryerson & Son, Inc.**, have announced the appointment of **Alfred J. Olson** as Asst. Sales Manager of their Chicago plant.

**Titeflex, Inc.**—**Robert E. Carbauh** has been named Sales Manager of the newly created department for the development and promotion of fire control equipment.

**Lyon-Raymond Corp.**—**George G. Raymond, Jr.** has been named Sales Manager, **William L. Peck**, Asst. Sales Manager, **Frank Forsberg**, Factor Manager, and **Seth Wiley**, Purchasing Agent.

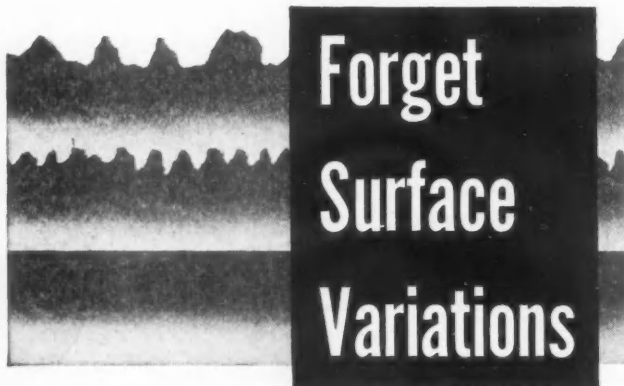
**American Brakeblok Div. of American Brake Shoe Co.**—**William T. Kelly, Jr.** elected First Vice-President. In addition to his new duties, he will continue as President of the Kellogg and Engineered Castings Divisions.

**Casco Products Corp.**—**John J. Reidy**, Sales Manager of the Appliance Div.

**Detrex Corp.**—**W. F. Newbery**, appointed Asst. Director of Sales.

**The International Nickel Co., of Canada, Ltd.**—**Ralph D. Parker, J. Roy Gordon** and **Herbert G. Fales** have been made Asst. Vice-Presidents and **Walter C. Kerrigan, James F. McNamara** and **T. H. Wickenden** have been elected Vice-Presidents of The International Nickel Co., Inc., U. S. Subsidiary.

**Pennsylvania Flexible Metallic Tubing Co.**—**Samuel H. Collom, Jr.** has been elected Executive Vice-President.



**MERZ NEW-MATICS ACCURATELY MEASURE I.D. OR O.D. . . . REGARDLESS OF SURFACE CONDITIONS**

● Only **MERZ New-Matic** Measuring Machines enable you to obtain identical I.D. or O.D. readings—every time—on parts of like diameter . . . regardless of surface variations. In **MERZ New-Matics**, a synthetic ruby button contacts only the highest surface points. Unlike conventional gages—where compressed air directly touches all surfaces, high and low alike—**MERZ New-Matics** are unaffected by any surface variations.

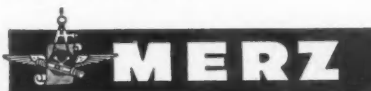
For the same reason, **MERZ New-Matics** are the only air-actuated units capable of accurately gaging parts in which perforations or keyways have been machined. **MERZ New-Matic** Measuring Machines also permit accurate gaging to the extreme edges.

For full details on these and many other advantages of **MERZ** inspection equipment, write for free 20-page book on the **New-Matic** principle of measuring and sorting.

**MERZ ENGINEERING COMPANY • INDIANAPOLIS 7, IND.**



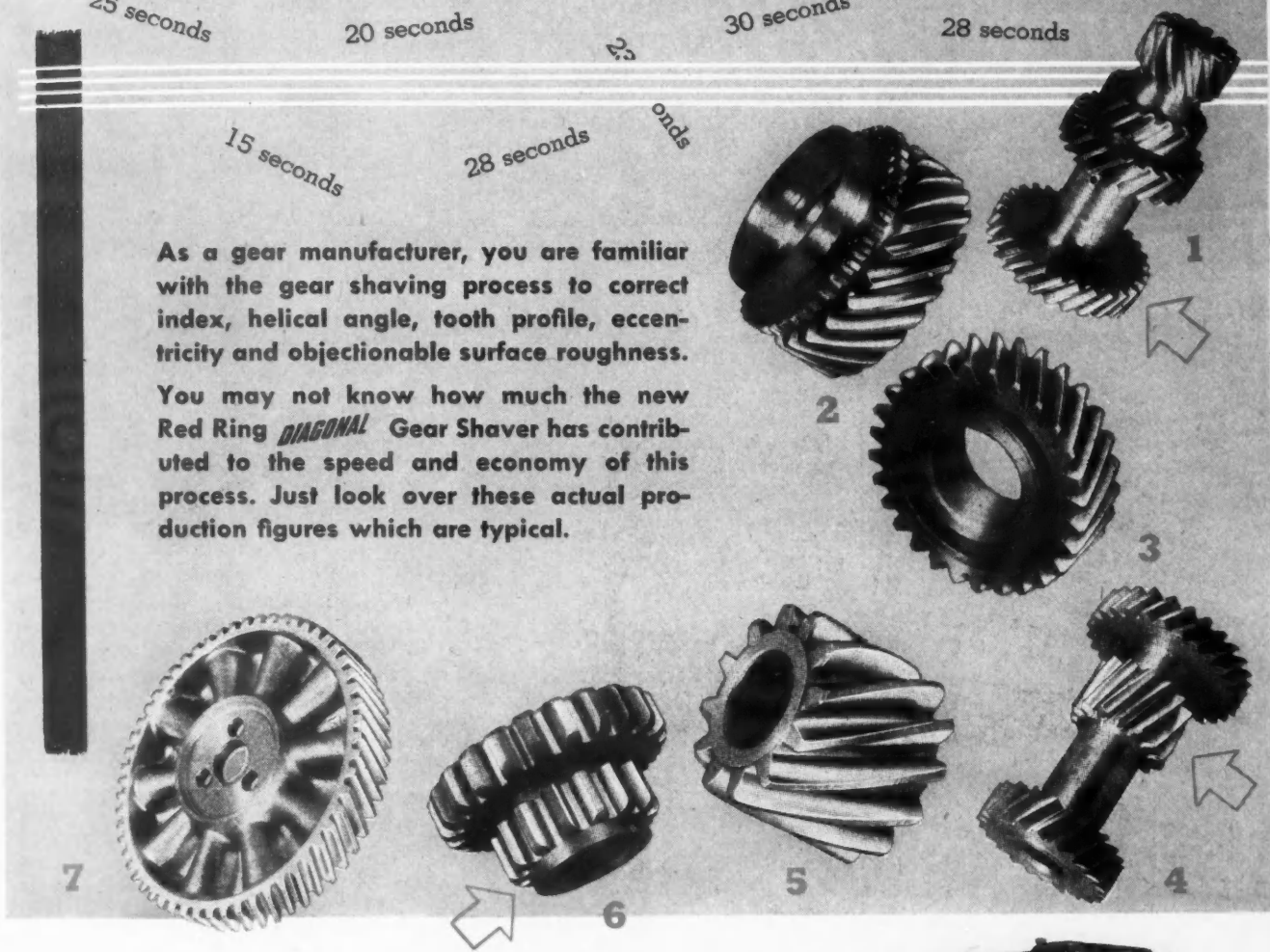
**MERZ "Master" New-Matic** Measuring Machine. Other **New-Matic** models for every inspection purpose.



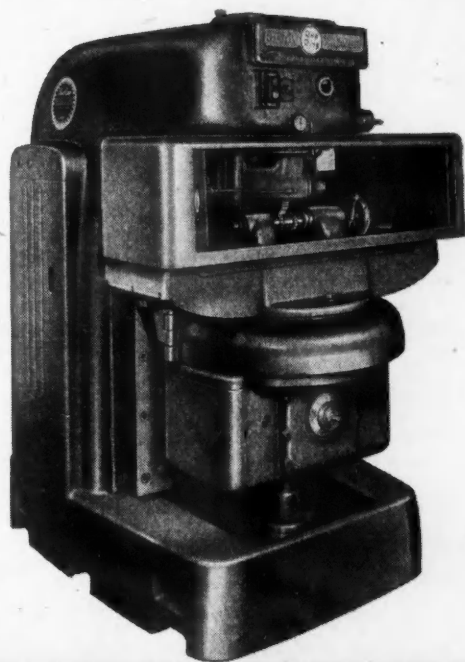


# Actual Gear Shaving Production Figures

As a gear manufacturer, you are familiar with the gear shaving process to correct index, helical angle, tooth profile, eccentricity and objectionable surface roughness. You may not know how much the new Red Ring *DIAGONAL* Gear Shaver has contributed to the speed and economy of this process. Just look over these actual production figures which are typical.



Gear	Material	Dia.	Face	Teeth	DP	Stock Removed over Pins	Machine Time
1	Steel	4"	1 1/16"	29	9.25	.010"	30 seconds
2	Steel	3 5/16"	1"	23	10.5	.010"	23 seconds
3	Cast Iron	2 5/16"	1 1/16"	28	10	.010"	20 seconds
4	Steel	2 1/4"	1 3/8"	14	7.6	.009"	28 seconds
5	Steel	1 1/8"	1"	12	13.5	.005"	9 seconds
6	Steel	2 9/16"	1 1/16"	14	6/8	.006"	15 seconds
7	Aluminum	6 1/2"	1"	56	10	.010"	25 seconds



For further information write for Bulletin S47-3 or, better still, consult a Red Ring Engineer.

**NATIONAL BROACH AND MACHINE CO.**  
5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

**ThredKut** \*

**INCREASED OUTPUT**

**4 to 1**



... reports  
**JOHN L. MOROSINI**  
D. A. Stuart Oil Co.  
Representative

"Prior to using THREDKUT,\* this customer had tried several types of cutting oil in tapping 1 1/2" dia. x 1" holes in very tough cast steel, with a maximum production of 50 tapped holes before sharpening was necessary. On switching to THREDKUT,\* output immediately increased to 200 tapped holes between sharpenings. Here is another instance where THREDKUT\* demonstrated its well-established reputation for licking a tough job."

*John L. Morosini*

**ThredKut** \*

... Stuart's THREDKUT is a unique cutting oil carefully manufactured to insure the maximum benefits from controlled chemical activity. Its outstanding performance on really tough jobs has long been recognized and its flexibility proved through exceedingly widespread use. The many time-tested values built into THREDKUT are serving the leaders of the metal-working industry, increasing efficiency and reducing costs.

Ask to have a Stuart Service Engineer discuss your cutting fluid requirements. THREDKUT literature available on request.

**STUART** service goes  
with every barrel

WRITE FOR DETAILS



**D. A. Stuart Oil Co.**  
EST. 1865 LIMITED

2733 SOUTH TROY STREET, CHICAGO 23, ILL.

## Publications

(Continued from page 58)

### H-21—Thermocouple and Pyrometers Accessories

The Bristol Co.—Bulletin No. P1235 covers thermocouples, protection tubes and pyrometer accessories. It gives detailed drawings, complete information and prices covering the accessories for pyrometers. Also included are a chart and valuable engineering data on selecting the right thermocouple and protection tube.

### H-22—Welding Gun and Booster

Dalhart Engineering & Mfg. Co.—A 4-page catalog describes the new Double-Acting Hydraulic Welding Gun and Booster. Blueprints of eight typical designs of guns that may be adapted to a wide variety of work and various thicknesses of metal are included, together with a sectional detail of the Booster.

### H-23—Anderometers

Physicists Research Co.—Numerical specification of bearing quality is explained in a new bulletin on the Type

BAA Anderometer—a mechanical-electronic shop instrument which gives an over-all quality rating of assembled ball bearings. The bulletin briefly discusses the unit of measurement of bearing quality, describes the functions of the various units comprising the Anderometer, explains how the instrument operates and outlines the advantages it offers. Detailed specifications are included.

## General News

(Continued from page 78)

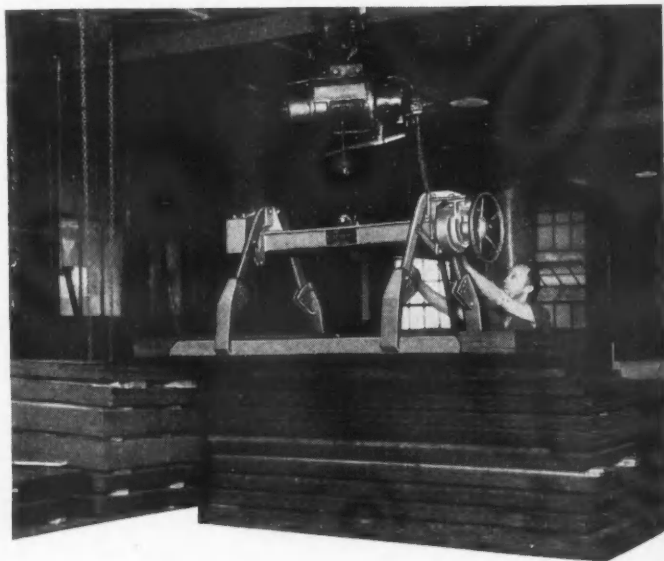
Chevrolet national service manager. He states that under such conditions cars should be washed once a week to remove the salt residue, since it will not only damage the body paint, but also is harmful to the chassis.

### New Continental C-90 Engine Powers 1948 Cessna Model 140

Externally, the new 1948 two-place Cessna model 140 is about the same as the 1947 model; however, the new model is powered by a Continental C-90 engine developing 90 hp at 2475 rpm. This model's top speed is over 125 mph. The new 1948 two-place Cessna model 120 will continue to employ the 85 hp Continental engine.

(Turn to page 84, please)

## Profits Begin Here . . .



When carloads of sheet stock are unloaded at the receiving room, actual manufacturing costs begin. But, when sheet stock is unloaded and carried into storage or to the machines with C-F Sheet Lifters, these costs are minimized—stock damage is eliminated and your end profit begins. Because C-F Sheet Lifters, under one man end or remote cab control, handle more sheets per load, safer, faster and more economically, they are the logical answer to

the demand for modern, low cost materials handling.

There are C-F Lifters in capacities from 2 to 60 tons or larger, in standard or semi-special designs to meet any sheet or materials handling requirement. Write for new Bulletin just off the press.

Cullen-Friestedt Co., 1322 S. Kilbourn Ave., Chicago 23, Ill.

**CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.**

When writing to advertisers please mention AUTOMOTIVE INDUSTRIES



## SEALING OILS WITH SYNTHETIC RUBBER

ARE YOU LOOKING FOR INFORMATION on sealing oils with synthetic rubber, on proper flange design, on designing gaskets to reduce cost, or on correct compression for resilient sealing materials? Then look into the new 20-page booklet, "Armstrong's Gasket and Sealing Materials."

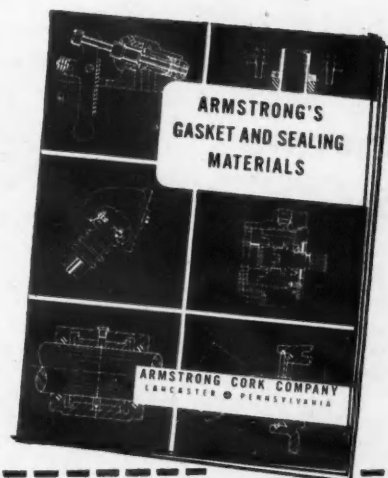
This booklet contains ten technical discussions on many of the variables that influence the design of gaskets and gasketed joints. "Armstrong's Gasket and Sealing Materials" also includes physical data on the five major types of sealing materials offered by Armstrong: synthetic rubber compounds, cork-

and-synthetic-rubber compositions, cork compositions, fiber sheet packings, and rag felt paper.

"Armstrong's Gasket and Sealing Materials" is as useful to purchasing men as it is to designers and engineers. It will pay you to refer to this booklet whenever you need data to make tentative selections of suitable resilient gaskets or sealing materials. Send coupon for your copy today.



**PARTIAL CONTENTS:** Designing Flanges for Efficient Sealing, Designing Gaskets to Reduce Cost, Effect of Gasket Width on Compression, Effect of Surface Condition on Gaskets, Factors in Choosing Resilient Gaskets, Proper Compression for Resilient Gaskets, etc.



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Please send me at once a free copy of the new 20-page booklet, "Armstrong's Gasket and Sealing Materials."

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**ARMSTRONG'S**  
GASKETS • PACKINGS • SEALS



## General News

(Continued from page 82)

### Air Force Fails to Renew Allison's V-1710 Contracts

Jobs for more than 5400 employees will continue to be furnished by GM's Allison Div. at Indianapolis, in spite of the recent layoff over an extended period of an estimated 1100 persons employed in the production of V-1710 reciprocating engines for

the Air Force, which failed to renew Allison's V-1710 engine contracts. The last contract for the V-1710 engines was for the P-82 Twin Mustang. It is possible that many of the employees laid off in recent months may be reemployed by Allison in the production of turbo-jet engines. Allison is now producing two jet engines, and other types of turbine engines are scheduled for production at a later date. Bulk of the latest jet-powered military fighters are now powered with either Model 400 J-33, or the J-35 jets produced by Allison.

### Boeing Gets USAF Contract for 82 More B-50 Superfortresses

Involving an expenditure of between \$50 and \$60 million, a new contract for 82 additional Boeing B-50 Superfortresses was jointly announced recently by the U. S. Air Force and the Boeing Aircraft Co. This brings to 215 the total number of B-50's ordered by the USAF.

### Hall-Scott Motor Now a Division of ACF-Brill

Effective Dec. 31, 1947, the Hall-Scott Motor Car Co., a wholly-owned subsidiary of ACF-Brill Motors Co., has been dissolved as a separate corporation, and will be known as the Hall-Scott Motor Div. of ACF-Brill.

### Vickers' Waterbury Tool Div. Buys Hall Mfg. Co., Toledo

The Waterbury Tool Div. of Vickers, Inc., has purchased the Hall Manufacturing Co., Toledo, Ohio, manufacturer of automotive tools.

### More and More Interest in Bonding of Brake Linings

Bonding of brake linings to shoes is considered by most manufacturers to be a coming development. Chrysler is already using this method on Dodge truck brakes on ½ ton models, and is also reported to be considering it seriously for passenger cars. Experimental work by one brake manufacturer may lead to much easier replacement of the bonded brake assembly. The development consists of a thin steel band to which the lining is bonded. The band itself is easily attached to the brake shoe and locked securely into place since it is not necessary to remove the brake assembly.



### Exclusive

### Snap-Mount Design...

1. Saves money...reduces assembly time.
2. Makes possible multiple breaker installations in virtually any combination.
3. Brings complete protection to automotive electrical equipments, simply and economically.

Now—an important addition to the service-proved FASCO line of circuit breakers... the FASCO Snap-Mount Circuit Breakers. Note the dimples in the mount and circuit breaker case shown in the magnified view. They give the snap-action. Circuit breakers snap into the mount securely and quickly, by finger pressure. No spot welding. No screws. No tools needed. And, if desired, the mount can be attached to the car body... the circuit breakers assembled on the wiring harness, and snapped into the mount when the car is wired. Write for further information, or phone our Detroit office, 6432 Cass Avenue, Detroit 2, Mich., Phone, Madison 6300.

PRODUCTS OF

**FASCO**

F. A. SMITH MFG. CO., INC., ROCHESTER 2, N. Y.

Electrical Engineering and Manufacturing  
Serving the Automotive Field Since 1922

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## Obituary

### Curtis C. Cooper

Curtis C. Cooper, 65, former president of the General Motors Acceptance Corp., died on Jan. 1 in Phoenix, Ariz.

### Oscar M. Polk

Oscar M. Polk, 71, chairman of the board of directors, Sheffield Corp., Dayton, Ohio, died suddenly on Nov. 22.

### Charles F. Conn

Charles F. Conn, sales manager, Distributor & Replacement Parts Div., Trico Products Corp., died suddenly on Dec. 20 in Buffalo.

# Thompson Products

*offers an*

## IMPROVED, LOW-COST SODIUM-COOLED VALVE

for AUTOMOTIVE ENGINES

with

*Fully Hollow Head*  
for increased  
cooling efficiency

Fully hollow head —  
liquid sodium contacts  
maximum area  
for faster cooling

Hard alloy seat  
(optional)

Metallic sodium  
content approximately 60%

Hard alloy  
tip  
(optional)

The Thompson Sodium-Cooled Valve can be made to suit individual thermal characteristics of any car, truck, bus or tractor engine, by altering the sodium content and cavity contours of head and stem.

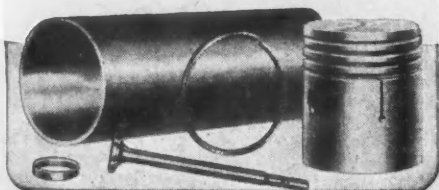
THE NEW THOMPSON  
SODIUM-COOLED VALVE  
for automotive, marine and industrial  
engines has a *fully* hollow head as well as  
a hollow stem.

Heat is dissipated more rapidly from the  
valve head, permitting higher compression  
ratios with longer service life.

The Thompson Sodium-Cooled Valve fea-  
tures a flexibility of design that permits con-  
tours and areas of the cavity in head and stem  
to be varied to fit the thermal characteristics  
of different engines.

Thompson engineers will be glad to work  
with manufacturers to determine what  
design is best suited for their particular  
requirements.

Thompson improvements in precision parts  
engineering include Steel-Belted Pistons, U-  
Flex Oil Control Rings, Cylinder Sleeves,  
Valve Seat Inserts, Sodium-Cooled Valves.



# Thompson Products

CLEVELAND • DETROIT • LOS ANGELES • ST. CATHARINES, CANADA

# New Low Floor Level Coach Bodies Fabricated by Arc Welding

BY F. E. HUMPHREYS, CHIEF ENGR.  
LINN COACH AND TRUCK DIV.  
GREAT AMERICAN INDUSTRIES  
ONEONTA, N. Y.

**B**UILT to carry greater payloads, the new Linn Speed Van combines lightness, rigidity and strength through an all-welded steel body construction. The floor design lowers the center of gravity for greater safety, provides greater loading space and makes for even easier loading and unloading.

The all-welded construction enables four different lengths of coach body to be assembled on a production basis using but one set of holding fixtures. The fixtures are designed and built to hold the parts accurately in position for sub-assembly and to eliminate warpage while the coach frame is being weld assembled.

The roof (Fig. 1) is held in a revolving fixture capable of holding the four different sizes of body lengths. The roof frame is built of high carbon pressed steel roof carlines and carline brackets tied together in the center with  $1\frac{1}{4}$ " square tubing of 16 gauge. The side rails are 11 gauge formed channel. The frame is weld assembled with "Plane-weld 2" electrodes, using 300 ampere Lincoln "Fleetwelders".

The side frames are arc welded similarly in sub-assembly. The frame is made of  $1\frac{1}{4}$ " square tubing and 14

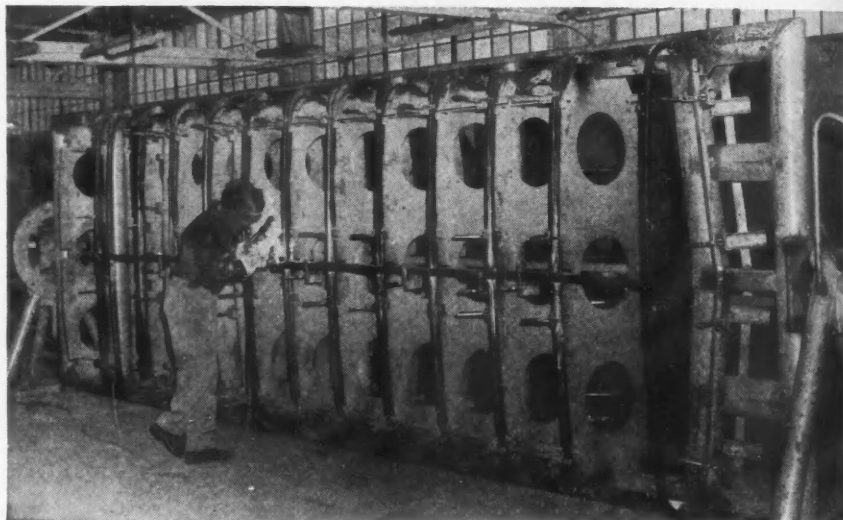


Fig. 1. Universal fixture holding roof components for arc welded assembly.

gauge SAE 1020 steel. Cross braces in the lower portions are of  $\frac{1}{8}$ " OD tubing with 14 gauge gussets making up the trussed tubular steel construction. Welders working in pairs complete one set of side frames in six man-hours.

The welded rear suspension sub-assembly (Fig. 2) incorporates a torsion bar suspension design that replaces conventional springs and permits greater road clearance as well as a lower floor level. The floor members are formed cross sections to which are welded the bearing carriers and center frame block steel castings reinforced at both ends by structural angle using "Fleetweld 37" electrodes because of their easy opera-

tion in vertical welds.

The motor rail sub-assembly (Fig. 4) is the basic foundation for the removable power train. It carries the radiator, engine and transmission, and allows the assembly to be replaced as a unit. The main motor rails are formed channel to which are arc welded the spring hanger castings, engine mounts, brake and clutch pedal assemblies, radiator mounting brackets and front bumper supports.

The cab likewise is arc weld constructed using  $1\frac{1}{4}$ " x 14 gauge square tubing and has an outside skin of 14 gauge steel. Other parts are subsequently welded to the main assembly as the assembly proceeds along the conveyor line.

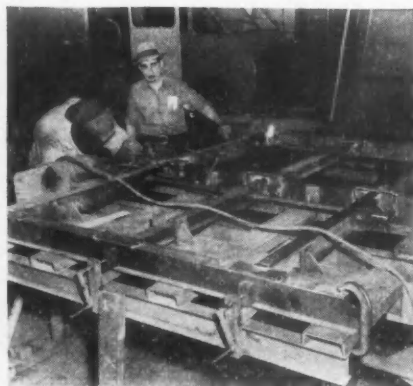


Fig. 2. All-welded rear suspension sub-assembly of torsion bar design.



Fig. 3. Modern all-welded  $1\frac{1}{2}$  ton, 17 foot, single wheel Linn Speed Van.

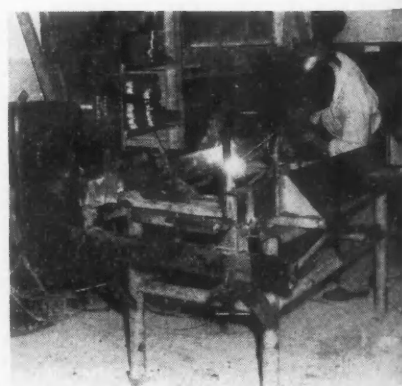


Fig. 4. Motor rail sub-assembly for mounting replaceable power train.

The above is published by LINCOLN ELECTRIC in the interests of progress. For welding engineering help, write The Lincoln Electric Company, Dept. 161, Cleveland 1, Ohio.